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GWDU, FWDU & MMIS
Development & Maintenance
FWDU User Manual

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FWDU User Manual

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SUMMARY: The purpose of this document is to describe how the FWDU Software is used. The manual is an edited version of the SAMMI User Manual 3.0

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	Approved by: Poul Erik Holmdahl
	Authorised by: Allan Mahler
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Dyregårdsvej 2
DK-2740 Skovlunde
Denmark

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Introduction to the FWDU

The FWDU (Flight Window Definition Utility) is an interface design system for use with the Runtime Environment. You can use the FWDU to create new on-board interfaces, or modify existing ones.

The FWDU consists of two tools:

- FWDU Format Editor - for editing Synoptic Displays
- FWDU Text Editor - for editing text files used by the Format Editor

FWDU Format Editor

The FWDU Format Editor (often just called the FWDU as this is the main tool) is a modification of the commercial tool *Sammi* from *Kinesix*. The Format Editor is used for creating and editing synoptic displays. The major new features in the FWDU compared to the standard Sammi product are:

- The FWDU interfaces to the MDA. File saves and read are directed to the mission database application.
- The FWDU checks each display for consistency errors and reports them at save time.
- The FWDU can preview displays.
- The FWDU handles On-board Commands and Pre-defined Commands.
- The FWDU generates cross reference lists in the MDB.
- The FWDU automatically files out several attributes in each DDO based on the attached End Item.
- The FWDU can generate display reports.
- The FWDU has an improved user interface.
- The FWDU automatically files out the logical server fields.

More details about the FWDU Format Editor can be found in the remainder of this document.

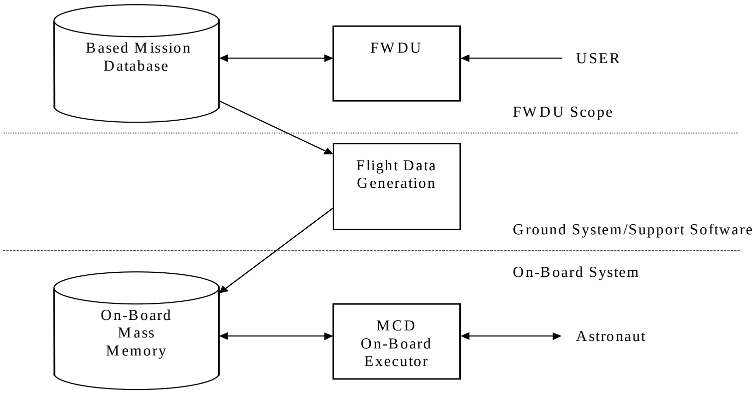
FWDU Text Editor

The FWDU Text Editor is a basic editor for writing and modifying text files used by the FWDU. The Text Editor reads/saves the files from/into the mission database. The Text Editor has some intelligent functionality which at save time and at read time checks the text and modifies it if necessary.

The basic functionality of the FWDU TExt Editor is described in Chapter 9 The FWDU Text Editor.

Tools Interacting with the FWDU

The FWDU is a part of the Columbus Ground System and it is used for creating and editing on-board synoptic displays used for controlling and commanding the Columbus Orbiting Facility (COF).



The FWDU creates and stores synoptic displays in the Mission Database (MDB). The synoptic displays are hereafter read from the MDB, converted, and placed on the COF on-board laptop called LAPAP. The displays are fed with data from the on-board data management system (DMS) via the logical server called the MCD (Mission Control and Display). Commands triggered by the astronaut are read from the display by the MCD and passed on to the COF systems.

Who can use this manual

This manual assumes that you have a basic understanding of computers, networking, and interfaces. This includes anyone who has used window-based computer software and understands good user interface design. It also includes anyone who has used a workstation on a network and understands how networking allows users to share information and resources. If you have experience using drawing programs, you will find the Format Editor’s drawing features familiar and easy to use.

As a format designer, you may have to work closely with, or consider the needs of, these other *Sammi* users:

- ***Sammi* End User**. The person for whom you are designing a user interface. The *Sammi* end user will use your formats in the Runtime Environment to handle a real-world application. The *Sammi* end user is typically a person who understands the application itself but not necessarily the technical aspects of computers and workstation environments. Therefore, all of your planning and design should be carried out with the goal of making the end-user interface as intuitive and user-friendly as possible. As part of the format design, you or someone in your organization may have to create special end-user documentation for the *Sammi* user.

- ***Sammi* System Administrator**. The person who has installed the system and maintains security levels, passwords, etc. The System Administrator is typically a person with a solid understanding of the workstation environment (including setting up the X Window System), who may be able to help you understand many of the technical aspects of *Sammi*.

- ***Sammi* API Programmer**. The person who works with the Application Programming Interface (API) to create data servers and applications that will feed data into and out of the *Sammi* user interfaces you design. This person must be an experienced C-language programmer, but does not have to be an expert in networking or X Window System applications. You will need to work closely with this person to develop the data access portions of your user interface.

In some organizations, each of these jobs is held by a separate person with separate skills. If your talents are broad enough and the workload is small enough, you may be called on to handle some of these jobs yourself, in addition to format design.

How to use this manual

This manual is designed to provide all the information you will need to operate the Format Editor. The chapters are summarized below:

- Chapter 1, *Welcome to the Format Editor*, explains the basic operation and concepts related to *Sammi* and the Format Editor.
- Chapter 2, *Getting Started*, explains how to plan the interface design, how to start and stop the Format Editor, and how to operate the Format Editor.
- Chapter 3, *Learning the Format Editor*, provides step-by-step lessons that help you use the Format Editor to create a sample format.
- Chapter 4, *Format & Layer Description*, explains how to enter the general specifications for a format.
- Chapter 5, *Drawing Methods*, provides step-by-step procedures for using the Format Editor's Drawing Tools to draw background objects.
- Chapter 6, *Dynamic Field Description*, provides step-by-step procedures for creating or modifying dynamic fields built into a format.
- Chapter 7, *Display Types*, explains how to enter specifications for each display type associated with a dynamic field.
- Chapter 8, *Data Access Types*, explains how data access works and how to create data access descriptions that can link dynamic fields to live data.
- *Appendices*, provide additional reference information you may need to understand technical aspects of the Format Editor.

We recommend that you start by reading ***Chapter 2*** carefully, then follow the lessons in ***Chapter 3*** for a quick introduction to using the Format Editor. Once you understand how the Format Editor works, you can use the remaining chapters and appendices for reference on specific functions.

Basics of the Format Editor

The Format Editor helps make difficult computing tasks simple by letting you design and build *graphical user environments* that present data on the computer screen in intuitive, easy-to-read formats. For example, you could use the Format Editor to design:

- Computerized maps that show current activity at various locations around the country or around the world.
- Animated drawings, schematics, or blueprints with imbedded “live data” that change dynamically over time.

- Control panels with knobs and buttons that really “work” to control processes, instruments, or equipment at any remote location.

- Improved computer interfaces that merge data from a wide variety of sources on a computer network into a simple, readable form.

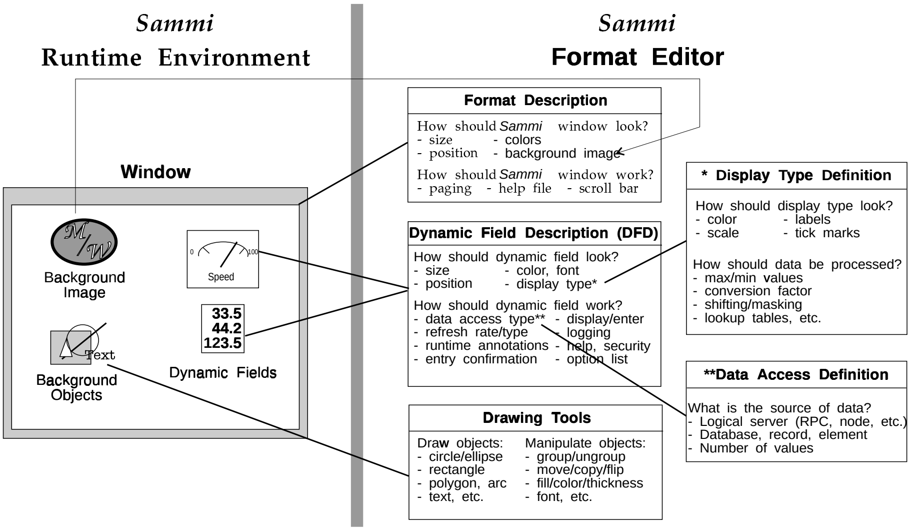
Display formats built with the Format Editor become active when you use them in the Runtime Environment, subsequently referred to as *Sammi*. Since *Sammi* operates under the X Window System, each display format is presented inside a movable window that can be manipulated with a pointing device, such as a *mouse* or *trackball.*

Thus, the Format Editor is the *display builder* used to create user interfaces and *Sammi* is the *display manager* used to provide runtime operation of the interfaces created using the Format Editor.

The most valuable feature of the Format Editor is its ability to simplify the interface design process. The Format Editor lets you scan in maps, drawings, or other background images; add drawn objects to the background image; and then add dials, graphs, or other built-in display elements.

In the past, up to 90 percent of the effort required to develop mouse-and-window interfaces was taken up by the design and building of the user interface. The Format Editor makes interface design simple, so that designers can concentrate on what they do best– creating better applications.

The basic concepts of how you use the Format Editor are illustrated below:


Sammi
Runtime Environment
Sammi
Format Editor
Window
M/W
Background Image
0
100
Speed
33.5
44.2
123.5
Text
Background Objects
Dynamic Fields
Format Description
How should *Sammi* window look?
- size - colors
- position - background image
How should *Sammi* window work?
- paging - help file - scroll bar
Dynamic Field Description (DFD)
How should dynamic field look?
- size - color, font
- position - display type*
How should dynamic field work?
- data access type** - display/enter
- refresh rate/type - logging
- runtime annotations - help, security
- entry confirmation - option list
Drawing Tools
Draw objects:
- circle/ellipse
- rectangle
- polygon, arc
- text, etc.
Manipulate objects:
- group/ungroup
- move/copy/flip
- fill/color/thickness
- font, etc.
* Display Type Definition
How should display type look?
- color - labels
- scale - tick marks
How should data be processed?
- max/min values
- conversion factor
- shifting/masking
- lookup tables, etc.
**Data Access Definition
What is the source of data?
- Logical server (RPC, node, etc.)
- Database, record, element
- Number of values

Windows

The Runtime Environment displays data using the standard movable windows environment of the X Window System. Each window may include *static components* that do not change and *dynamic components* that are changed by incoming data or by *Sammi* users.

Formats

For each window that will appear in the Runtime Environment, you create a corresponding *format* using the Format Editor. The format serves as the basic blueprint for the final *Sammi* window, including its size, color, position, and all of its components. The Format Editor allows you to construct formats using a set of Drawing Tools, Drawing Area, and a series of ready-made display components, as described next. The format itself does not become an active window until *Sammi* is started and an **add-window** command for your format is issued.

Static components

Each format that you create using the Format Editor may include static visual elements that are not designed to move or change when they appear in *Sammi*. There are two types of static components:

- Background images are graphical images derived from various sources such as business logos, maps, photographs, and blueprints that have been scanned into the computer using a digital scanner. Typically, a background image serves as a backdrop for the information being presented in a window. For example, you could scan in a picture of a control panel, then overlay various dynamic components such as dials and push buttons (described next).

- Static objects include text labels and geometric shapes such as circles, ellipses, arcs, curves, lines, polygons, and rectangles. You can use these shapes to construct simple diagrams or pictures of process components that will help make the interface more visually useful to the operator. With the Format Editor, you draw most static objects with a few clicks of the mouse. Though these objects normally are static within a display, they can also be given dynamic properties using the Dynamic Object display type discussed in ***Chapter 7***.

NOTE: *Static objects* are drawn on top of the background *image*.

Dynamic components

You can create formats which include dynamic components that reflect changes in their states during runtime (that is, while *Sammi* is running). For example, a format can include a gauge that represents the changing of the pressure reading in a boiler, or a push button that lets the *Sammi* user send a warning signal (or message) to another workstation simply by clicking on the button.

Each dynamic component is contained inside of a *dynamic field* — a physical area of the format that has been reserved for a specific function. With the Format Editor, you define all aspects of the dynamic field, including size, color, position, data inputs, and function on the *DFD (Dynamic Field Definition) Display* panel. The dynamic field description includes a *display type* and *data access type* as discussed below.

You indicate the function of a dynamic field by selecting a particular *display type* on the *DFD Display* panel. The display type that you select has general characteristics you can customize. For example, if you select the *Meter* display type for a dynamic field, the Format Editor creates the dynamic field to look and work like a meter. All you have to do is define the colors, dial limits, labels, and other physical attributes of the meter — no drawing is required.

Summary of Available Display Types

Dynamic Function Required	**Display Type(s) Used**
Area definition	Region
Bar graphs/Charts	Bar Graphs, Barcharts, Pie Charts
Calculations	Equations
Command initiation	Push Buttons, Object Icons, Toggle Buttons, Menus, Option and Selection Lists
Data entry and/or display	Reals, Integers, Text, Custom Time, Text Browser, Formatted Numeric Output, Sliders, Tabulars
Data scrolling	Scrollbars
Dynamic messages	Text Table
Dynamic movement of static objects	Dynamic Objects
Dynamic symbols	Symbol Table, Object Icons
Graphs, standard x/y	Plots, Trends, Curve Sets
Graphics	Graphic Data Field
Menus	Pulldown Menus, Cascading Menus, Popup Menus
Meters or gauges	Meter, Gauge, Fixed or Moving Scale Linear Meters
Popup lists to select entry options	Option and Selection Lists

Display Types supported by Sammi but NOT by FWDU

Dynamic messages	Alarm

Data access types

Most dynamic fields provide a direct link to “live” data. For example, a *Meter* DFD might be linked to a pressure sensor on a boiler and show the current pressure as a reading on its dial. This linking of dynamic fields to live data is called *data access*. *Sammi* provides three major types of data access (for a complete list, refer to ***Chapter 8***):

- **Local.** The dynamic field receives data from local sources, such as other dynamic fields. For example, a *General Action Button* dynamic field might be designed to send a message to a *Text* dynamic field in the same format or other formats on other workstations running *Sammi*.
- **Time**. The dynamic field gets the current time and/or date from the system clock. This is only used with the *Custom Time* dynamic field.
- **Universal.** The dynamic field is linked to a remote source via the *Sammi* Application Programming Interface (API).

The FWDU supports the attachment of by having a “End Item” buttons whenever a data source can be attached. The type of the end item is read automatically from the Mission Database Application (MDB). When attaching an End Item a browser can be opened so that the user can select valid End Items which are valid in the context. For each dynamic filed different sets of End Items can be attached. How to attach the End Items is described together with each dynamic field.

Application Programming Interface (API)

Most computer programs are designed to work with a certain set of data that the program itself builds and maintains. *Sammi* is different, however, because it accesses data from other sources that may exist in a wide variety of locations on a network, including:

- Databases
- Other applications
- On-line instruments

Since the variety and location of data sources is so diverse, *Sammi* is designed to interface to each individual installation using the optional *Application Programming Interface (API)*, a set of standard functions designed to handle communication between *Sammi* and remote data sources. Part of the API, however, must be modified by a computer programmer experienced in C-language.

Different *applications* can be set up to handle data transfer to and from *Sammi* and remote processes. For example, one API *data server* might provide access to NDBM databases, and another to SQL databases, and an API application could be written to channel the flow of data from on-line instruments into certain *Sammi* windows.

NOTE: The LAPAP software provides a data server which is called the MCD. The logical server name is however FWDU_SERVER. A preview data server is provided with the FWDU so that synoptic displays can be previewed. This data server just provides the displays with random data inside the provided limits.

For more information

If you need more information about *Sammi* and the Format Editor, please consult these related manuals available from Kinesix.

- ***System Administrator's Guide***. This manual explains the installation of *Sammi*, system setup, control of system processes, administrative commands, and utility functions; typically your System Administrator will perform these functions.
- ***Command Reference.*** This manual lists all commands required for operating the *Sammi* system.
- ***Application Programming Interface (API) Guide***. This manual explains how C-language programmers can use the optional Applications Programming Interface (API) to create their own applications for exchanging data between customer-developed software and *Sammi*.

A supplemental manual, the ***Contributed Software Guide***, introduces a sample database and data server that can be used to provide test data for *Sammi* windows designed using the Format Editor.

Most of these manuals are available at any site where *Sammi* is installed. If they are not, please contact Kinesix for information at (713) 953-8300.

This chapter explains how to get started using the FWDU Format Editor (sometimes simply called the FWDU and other times Format Editor - depending on the context), including how to:

- Plan the interface design,
- Start and stop the FWDU Format Editor,
- Use the mouse and windows with the FWDU Format Editor, and
- Create, view, modify, copy, and delete formats.

Before reading this chapter, you should understand the basic concepts and terminology presented in ***Chapter 1***.

Planning the interface

Before using the FWDU Format Editor to design new *Sammi* formats, you must first decide how you want the ultimate product to look and what it should accomplish. Your planning should consider a number of different factors:

- What display/control functions should be included? Who will be the users of this new system? What types of data are essential to them? Where will the data come from? What types of control and updating functions should these users have?
- How should data be represented? Should data values be displayed literally (perhaps as numbers or text) or represented graphically (as a gauge needle position)?
- What presentation aids should be used? Could the user benefit from buttons, menus, on-line help, or other available features?
- How should the interface be structured? Should data be presented in a single window or in a series of “pageable” windows which show different levels or categories of data?
- What are your prototyping/review requirements? Will the design need to be approved by managers, committees or end users? Will you need working demonstration models?
- How will formats be tracked? Each format is stored as a file on disk. Do you want to adopt a standard file-naming scheme for keeping track of formats?

Each of these considerations is discussed in more detail on the following pages. The following discussion should help you pinpoint what you are trying to accomplish and how the Format Editor can help.

NOTE: If you only want to learn program operation right now, without getting into the details of design planning, you can skip the rest of this section and return to it later when you are ready to start creating your own production formats.

Data display/control functions

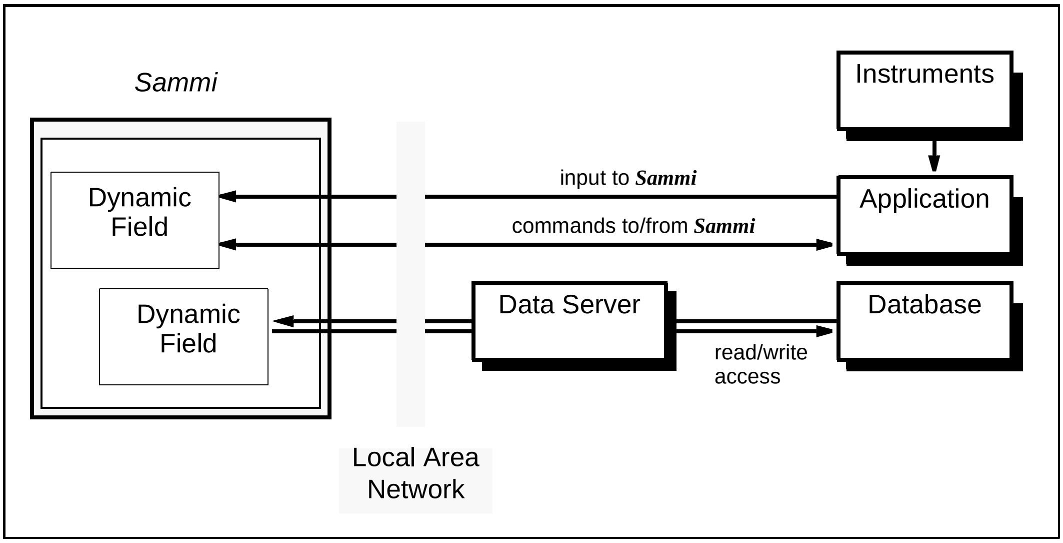
The main purpose of *Sammi* is to provide the user with visual access and control over a wide variety of network resources. One of the first decisions, therefore, should involve the types of data to be displayed and the types of control functions to be provided for users. *Sammi* provides access to a wide variety of network resources, including:

- **Databases.** *Sammi* can display data from any type of database (hierarchical, relational, custom, etc.) and let the user make changes to the data that are written directly back into the database.

- **Applications.** *Sammi* can exchange data and commands with remote applications. Thus, users can use *Sammi* to start remote applications and to receive data or commands back from them.

For example, by pressing a key or clicking the mouse, the *Sammi* user might start a remote application that reads in data from on-line instruments and issues alarms based on high or low instrument readings. When the alarm appears in the *Sammi* window, the user might push another key (or use the mouse to click on a button) to access a database and call up a list of persons to be notified about the alarm condition.

Communication between *Sammi* and remote data sources is handled through the Application Programming Interface (API). For this reason, you will need to coordinate the format design process closely with API programmers to make sure all of your planned data display and control requirements can be met.



Typical *Sammi* Input/Output

Display methods and types

Once you know what type of data should be displayed, you must decide the best way to display it. The Format Editor provides several different methods for displaying data. Each is accomplished by selecting the appropriate *display type* when you are setting up the dynamic field for that data in the Format Editor.

- Display types: *Real, Text, Integer, Custom Time*, and *Tabular.* You can create data fields that allow user entries and/or display of remote data. Any data displayed is shown “literally,” without being converted or interpreted. For example, if the incoming data value is 12, the number 12 is displayed.

  12 → 12

  You can also provide input/output access to ASCII text data with the *Text Browser Data Input/Output* display type.

- Display types: *Formatted Numeric Output, Object Icon, Symbol Table, Text Table, Alarm, Dynamic Object. Sammi* can present almost any concept symbolically. Instead of showing a data value literally, you can represent it graphically as:

  — Graphic symbols (e.g., open/closed valve, on/off switch) or short messages (such as “OK” or “PROBLEM”).

  — Lists of messages concerning alarms or system events (for example, “System Error at 145").

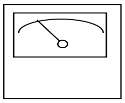
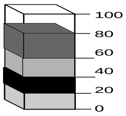
  — Blinking and moving objects.

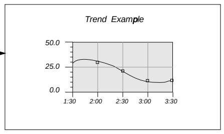
  Each of these effects is accomplished by creating a *lookup table* that specifies the characters or symbols to be substituted for certain ranges of incoming data values. For example, if the incoming data value is 12, it could be converted to a symbol or a message by comparing it to a lookup table, as shown below:

  12 → lookup table →

  12 → lookup table → "OK"

- Display types: *Bar, Gauge, Meter, Linear Meters, Moving-scale and Fixed-scale, Plot, Trend*. You can display incoming data as a readout on a scale or points on a graph. For example, an incoming data value of 12 could be represented by the position of a needle on a gauge, a slider on a bar graph, or a point on a curve:

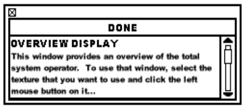
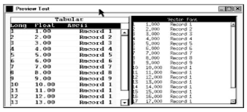
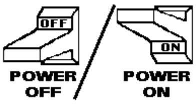
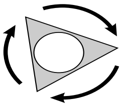
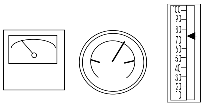
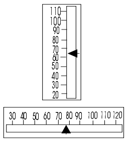
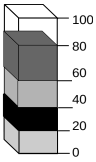
  12 →  12 → 

  12 → 

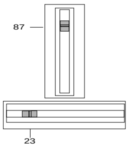
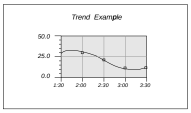
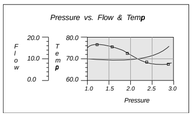
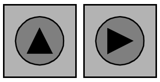
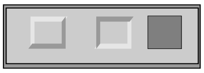
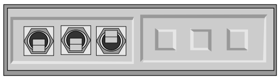
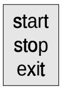
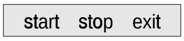
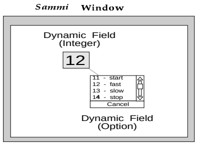
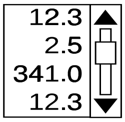
- Display types: *Equation*, *Menu*, *Option* and *Selection Lists, General Action Buttons, Scroll and Slider Bars.* Some display types are not linked to live data, but instead perform purely mechanical functions. For example, the *Equation* display type works like a calculator to show the results of calculations on other dynamic fields; *General Action Button* and *Menu* display types are used to activate a variety of functions; *Scroll Bar* display types are used with other dynamic fields to move through data that is larger than one screen; and *Option List* display types allow end users to make entries to a data field without typing.

The following chart, **Selecting Data Display Options**, lists the appropriate display types to be used for various desired effects. Each item in the list includes the name of a sample format that you can use as a model or a template for viewing or producing the desired effect. For example, to create a meter, you should use the *Meter* display type, an example of which appears in the sample format named `sample_meter`. View any sample format in the Format Editor or copy it for use as a template (see ***General Guidelines for Using the Format Editor*** later in this chapter). You can find specific information on each display type in ***Chapter 7*** of this guide.

Selecting Data Display Options

If Your Objective Is To...	***Use This Display Type:***	
Display current system time and date	Custom Time `(demo_ssdtg)`	12:30:34 9-14-94
Display editable text data *(static text, files, etc.)*	Text Browser `(sample_brwser)`	 OVERVIEW DISPLAY This window provides an overview of the total system operator. To use that window, select the texture that you want to use and click the left mouse button on it...
Display data and/or allow user entries	Real, Integer, Text `(sample_litrl)`	12.0 12 OFF
Display mixed data *(text and numeric)*	Formatted Numeric & Tabular `(sample_litrl)`	 Tabular Long Float Ascii 1 1.00 Record 1 2 2.00 Record 2 3 3.00 Record 3 4 4.00 Record 4 5 5.00 Record 5 6 6.00 Record 6 7 7.00 Record 7 8 8.00 Record 8 9 9.00 Record 9 10 10.00 Record 1 11 11.00 Record 1 12 12.00 Record 1 13 13.00 Record 1 Vector Font 1 1.000 Record 1 2 2.000 Record 2 3 3.000 Record 3 4 4.000 Record 4 5 5.000 Record 5 6 6.000 Record 6 7 7.000 Record 7 8 8.000 Record 8 9 9.000 Record 9 10 10.000 Record 1 11 11.000 Record 1 12 12.000 Record 1 13 13.000 Record 1 14 14.000 Record 1 15 15.000 Record 1 16 16.000 Record 1 17 17.000 Record 1
Display symbols that indicate the *nature of incoming data*	Symbol Table `(sample_sfs)`	
Display a message that changes based *on incoming data*	Text Table `(sample_afs)`	OK PROBLEM
Perform spreadsheet-like calculations *on other dynamic fields*	Equation `(sample_eqn)`	60.00 (x=5y)
Make background objects rotate, *blink, change appearance*	Dynamic Objects `(sample_dobj)`	
Show data as a needle moving *across a dial*	Meter, Gauge, Fixed-scale Linear Meter `(sample_meter)`	
Show data as a moving scale *across a reference point*	Moving-scale Linear Meter `(sample_msl)`	 110 100 90 80 70 60 50 40 30 20 30 40 50 60 70 80 90 100 110 120
Show data as a growing and *shrinking column on a bar graph*	Bar `(sample_bar)`	

Selecting Data Display Options

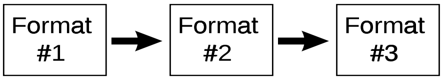
If Your Objective Is To...	*Use This Display Type:*	
Allow analog input of numeric data using a sliding control	Slider (`sample_slider`)	
Plot data points vs. time	Trend (`sample_trend`)	 Trend Example 50.0 25.0 0.0 1:30 2:00 2:30 3:00 3:30
Plot multiple data sets	Plot (`sample_plot`)	 Pressure vs. Flow & Temp 20.0 10.0 0.0 Flow Temp 80.0 70.0 60.0 1.0 1.5 2.0 2.5 3.0 Pressure
*Provide symbols that can be used to activate **Sammi** functions or system functions as well as to reflect their current state*	Object Icon (`sample_icon`)	
*Provide different button types that can be used to activate **Sammi** functions or system functions. These buttons can also have different states*	General Action Buttons (`sample_gabs`)	
*Provide mutually exclusive or non-mutually exclusive groupings of buttons that can be used to activate **Sammi** functions or system functions*	General Action Button Groupings (`sample_gabutton`)	
*Provide a menu bar or pop-up menu that activates **Sammi** functions or system functions*	Menu (`sample_menu`)	 Pop-Up Menu  Menu Bar
Provide a pop-up option list to allow user entries without keyboard input required	Option List (`sample_menu`)	 Sammi Window Dynamic Field (Integer) 12 11 - start 12 - fast 13 - slow 14 - stop Cancel Dynamic Field (Option)
Provide a scrollbar for scrolling other dynamic fields	Scrollbar (`ndbm01`)	

Helpful presentation aids

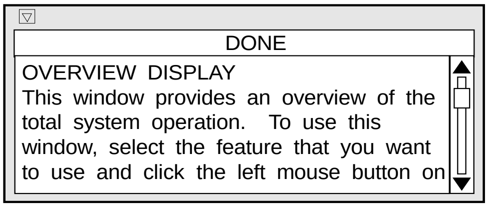
Other display types and design features that you can use to enhance the presentation of data include:

- **Layering.** This feature lets you create a format that consists of several layers, any or all of which can be visible at any given time. Once you have created the different layers, you can let the *Sammi* user hide and/or show a layer to reduce the complexity of the format (see next page).

- **Paging.** This feature lets you connect various formats and pages between them using the *Sammi* paging commands (see the discussion on the next page and in ***Chapter 4***.).

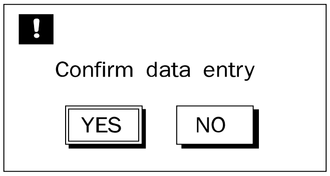


- **On-line help**. This feature lets you store help information for a format or a dynamic field in a text file where the *Sammi* user can view it by clicking the mouse OPTION button while holding the SHIFT key down (see ***Chapter 4*** for details).



OVERVIEW DISPLAY
This window provides an overview of the total system operation. To use this window, select the feature that you want to use and click the left mouse button on

- **Entry confirmation**. This feature can be used with any dynamic field that allows user entry of new data. A dialog box pops up, allowing the user to confirm the entry.



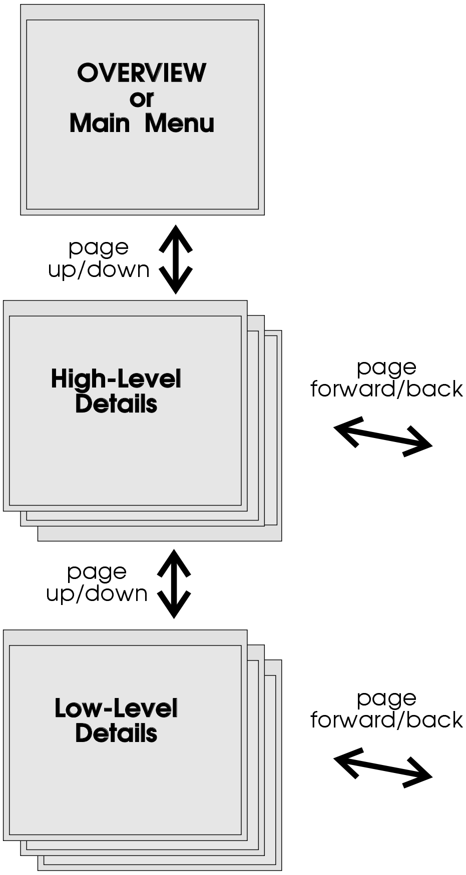
Confirm data entry

As part of the design process, you may want to plan ways in which these aids can be used to improve the final *Sammi* interface.

Creating a user-friendly interface

For maximum ease of use, each format that you design for *Sammi* should present data so that it is simple to read and visually uncluttered. When you have to present a lot of data, there are two approaches that you might use:

- Creating multiple formats, each presenting a different category or “level” of data. The Format Editor lets you create as many different formats as desired to provide a multiple-window interface. For example, you might start with a single format that presents a summary overview of the data (see diagram below), then tie other formats to it that present different levels of detail.



You can use push buttons, paging, or menus to link formats together in such a way that users can easily and intuitively work their way up, down, or across a series of data displays. For example, you might have a map of a region with transparent push buttons over each major city. Clicking on a city calls up another window (or series of windows) with sales figures, demographics, shipment volumes, or other information for that city.

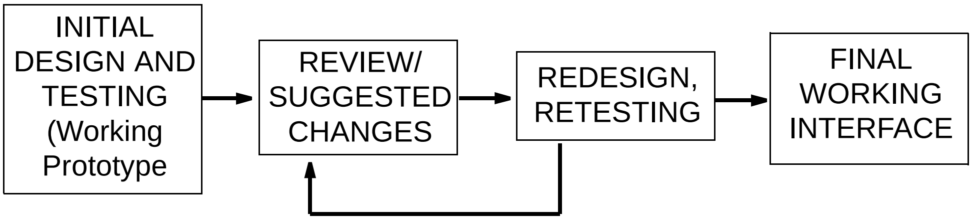
- Creating a single format with several "layers" (up to 64). The *Sammi* user can then hide/show each layer with the *Layers Attribute* panel, which the user accesses either by clicking the mouse OPTION button in the format and clicking the mouse SELECT button on the *Modify Layers* option or by adding the *Layer* format with the **add-win** command in the Runtime Environment.

Layering can be automatic so that when the user zooms (magnifies) a format, the layers disappear/reappear (declutter/clutter) automatically depending on the level of magnification. The levels are controlled by you, the format designer, at format creation time.

Prototyping/review cycles

Unlike other interface building programs, all designs created with the Format Editor are immediately usable by the *Sammi* Runtime Environment. This saves compiling and linking time. Instead of simply creating a picture of an interface, you use the Format Editor to create actual, ready-to-use interfaces.

You can still use manual sketches to draft the interface design, if that is what your review/approval process requires. But the Format Editor also makes it easy to start prototyping with a working interface and to move the design through multiple review and demonstration cycles until final approval is reached.


INITIAL DESIGN AND TESTING (Working Prototype
REVIEW/ SUGGESTED CHANGES
REDESIGN, RETESTING
FINAL WORKING INTERFACE

Typical Work Flow for Interface Development

You can use the **hard-copy** command (see the ***Command Reference)*** to produce high-quality printouts of the final interface design in place of hand-drawn or drafted sketches.

With the FWDU you can quickly check the formats you have designed by previewing them.The preview sends random data to the displays with-in the limits specified for the End Item.

Format naming/tracking

You have to comply to the Mission Database naming conventions. You may use letters, numbers and the underscore character. The names are checked when you create End Items in the I_MBD. You may consider a standard naming scheme that will help you and others keep track of the various formats. It is also useful to use Virtual Nodes for grouping formats and other data types.

Starting the FWDU Format Editor

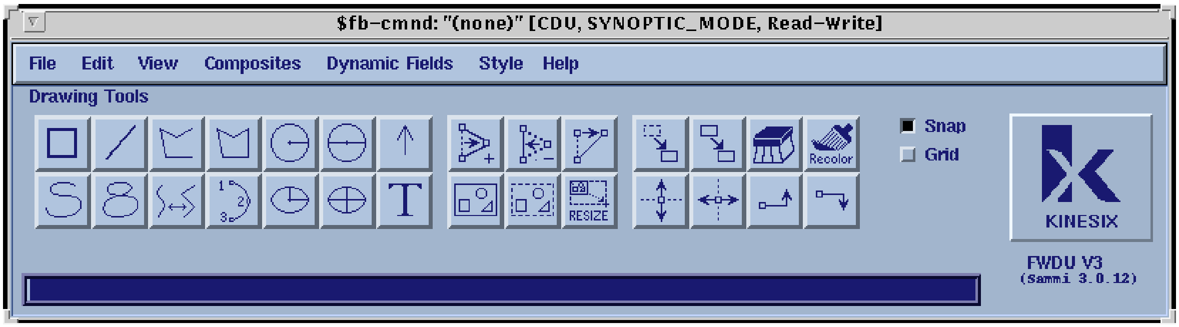
NOTE: Before the FWDU can be used for the first time, it must be installed on your workstation. Please see the FWDU installation guide.

To start editing with the FWDU Format Editor select an End Item of the type FWDU_SYNOPTIC_DISPLAY, FWDU_LIBRARY_BINARY, or FWDU_COMPOSITE_BINARY and click with the right button. Now select the Tools and then FWDU Editor ... The FWDU Format Editor will now start.

NOTE: If you want to edit an End Item of type FWDU_HELP_TEXT, FWDU_SYMBOL_TABLE_TEXT, FWDU_DYNAMIC_OBJECT_TABLE_TEXT, FWDU_LIST_TEXT, FWDU_CONVERSION_TEXT, FWDU_DATA_DEF_RECORD_TEXT, or FWDU_EQUIPMENT_CONSTRAINTS_TEXT you need to use the FWDU Text Editor. See chapter “The FWDU Text Editor” on page 365.

After a brief pause, the *Format Editor Control* panel appears, as shown below. This panel has (from top to bottom):

- a main menu,
- push buttons,
- a message line, and
- a command line.



Each item on the main menu has an associated pull-down menu, which may or may not have an associated “cascading” menu.

All format level commands, most editing commands, and other global commands are found on these menus. The push buttons are used to draw, edit, and manipulate static graphical objects in the *Drawing Area*. The message line displays system prompts, warnings, and general information. The command line is where you enter any command that is not available from the menus.

The Format Editor is now started and ready to use. Most Format Editor operations are discussed later in this chapter under ***General guidelines for using the Format Editor***. But first let's take a quick tour of the Format Editor to make sure you understand all of its components.

A quick tour of the Format Editor

Before you start using the Format Editor, please be sure you understand the features described on the following pages. If you have already started the Format Editor, you can practice working with some of these features.

Using the keyboard

The workstation keyboard is used in *Sammi* to enter commands or data. Since the correct keystrokes vary from one workstation to the next, we have provided a chart below to help you determine the correct keystrokes for each possible operation. For example, to *tab up* on a Sun workstation, press SHIFT R8 (hold down the SHIFT key and press the R8 key). To *tab down* on a DEC, press SHIFT KP2 (hold down the SHIFT key and press the number 2 on the numeric keypad).

Standard *Sammi* Keystrokes

Function	Sun Keyboard
Display command window	F1
Add a window	F2
Delete a window	F3
Confirm	F4
Cancel	F5
Page forward	F6
Page back	F7
Page up	F8
Page down	F9
Add window	
`sample_main`	F10
Quit *Sammi*	KP1
Confirm	KP2
Cancel	KP3
Erase to end-of-line	KP4

Function	Sun Keyboard
Erase field	KP5
Home	KP7
Cursor up	KP8
Tab up	ShfKP8
Previous word	KP9
Cursor left	KP10
Tab left	ShfKP10
Cursor right	R12
Tab right	ShfR12
Insert mode on/off	R13
Cursor down	R14
Tab down	ShfR14
Enter	R15
Backspace	Bksp
Delete	Del

When multiple windows are shown on the same monitor (or on a set of monitors) simultaneously, any keys that you press will apply only to the window with the focus; that is, to the window in which the cursor is located. You can change the window focus by moving the mouse cursor into a window and pressing the mouse SELECT button. The process that is controlling the active window handles any keyboard input.

NOTE: All keys are reprogrammable. The keys are programmed using the `keydefs.dat` file in the `$FWDU_HOME/lib` directory. If the keystrokes shown in the above table do not work, ask your system administrator for help.

The mouse

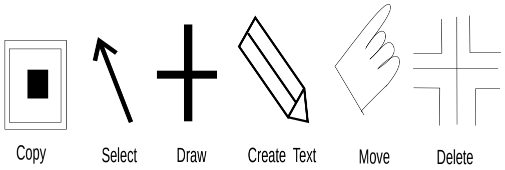
Many operations in the Format Editor must be performed using a pointing device, such as a mouse or trackball. Use of the mouse is discussed below.

Mouse movement

You can use the mouse to move the cursor anywhere on the screen. If your workstation has multiple monitors, rolling the mouse or trackball continuously in one direction moves the cursor across each of the screens.

Cursor shapes

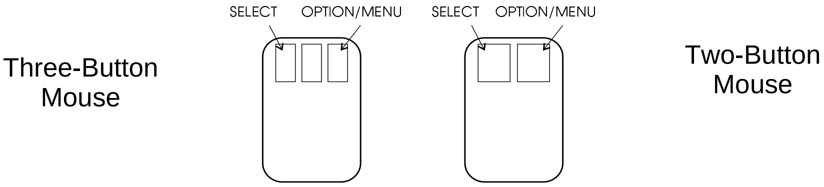
Normally, the mouse cursor looks like a slanted arrow. As you work with the Format Editor, however, the cursor may change shape to indicate that a special operation is underway. Typical cursor shapes are shown below:



Typical Cursor Shapes

Mouse buttons

The mouse buttons are used for various standard functions in the Format Editor. To avoid potential confusion between two- and three-button mice, this manual refers to mouse buttons by their functions, as shown below:



Mouse Button Functions

Button Name	***Button Function(s)***
SELECT	Used to click on selections and drag window panels or graphic objects. Used to move text cursor to new location. Used to indicate control points when drawing background objects (see ***Chapter 5*** for details).

OPTION/MENU

Used to pop up menus and/or option lists. Which pop-up menu or list appears depends on the location of the mouse cursor:

If the mouse cursor is outside of a DFD, or over a DFD with no pop-up option list, the pop-up menu defined as $MAINMENU appears.

If the mouse cursor is over a DFD (non-Motif) with an assigned pop-up option list (or selection list or menu), that list appears except during drawing operations that use the OPTION button to complete. These are drawings of polylines, polygons, open and closed splines, flip operations, and moving objects with the Front and Back operations. Otherwise, when no option list is specified for this DFD, a pop-up message appears stating "No Menu Available".

Used to indicate last control point when drawing objects with more than two control points (as explained in ***Chapter 5***).

Used with SHIFT key to view on-line “help” information (hold down SHIFT key before clicking OPTION/MENU).

NOTE: While in the Format Editor using the SHIFT + OPTION/MENU for help only displays the standard option menu.

Always use the SELECT button for “clicking” and “dragging” the mouse cursor, unless otherwise directed. Clicking means to press the button and release it while in one position. Dragging means to hold down the button while you move the mouse.

The Format Editor Control panel

The Format Editor provides a *Control panel* that appears when you first start the program. This panel has several areas:

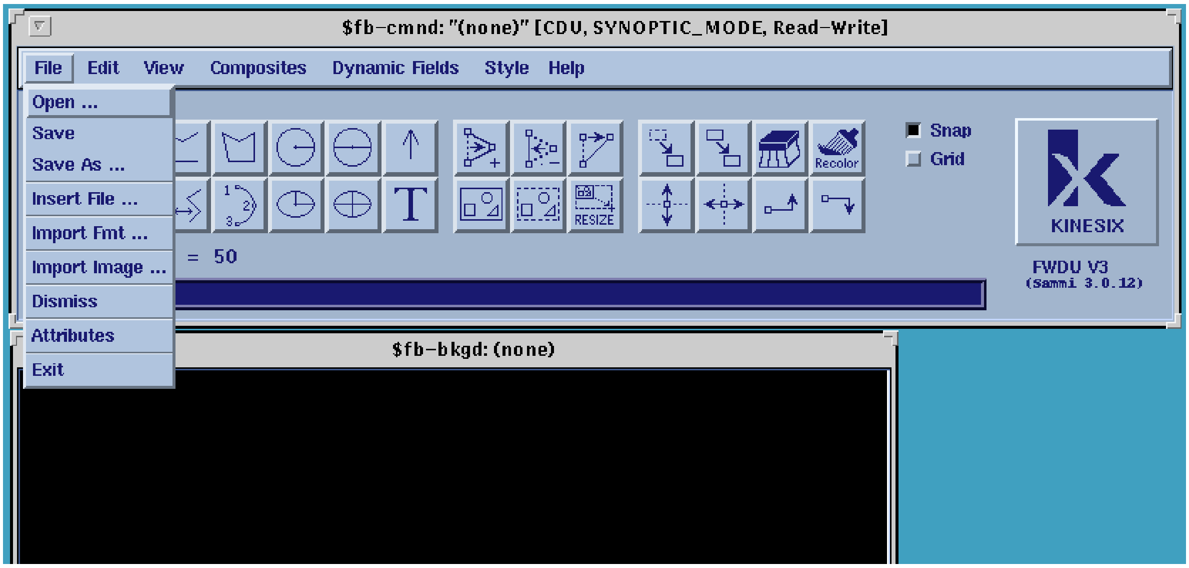
- The *Main Menu* for accessing the different commands.
- The *Drawing Tools* buttons to create static objects for formats. (See ***Chapter 5***.)
- The *Snap* and *Grid* buttons for turning those functions on and off. (See ***Chapter 5***.)
- The command line where you enter *Sammi* commands.
- The area above the command line where error messages, status information, and command feedback are displayed.

Pull-down menus

The following table is a summary of each of the menus and their options.

Format Editor Control Panel Menus

Menu option	Command equivalent	Purpose
File-Open	NA	Edit an existing format.
File-Save	NA	Save the format EI to the MDB.
File-Save As	NA	Save the format as another EI in the MDB.
File-Insert File	NA	Insert a format from the filesystem.
File-Import Fmt	NA	Import an entire format into the *Drawing Area*.
File-Import Image	NA	Import an image into the *Drawing Area*.
File-Dismiss	NA	Exit current format.
File-Attributes	NA	Display the *Format Attributes* panel.
File-Exit	quit	Exit FWDU.



Format Editor Control Panel Menus

Menu option	Command equivalent	Purpose
Edit-Undo	n/a	Undo last command.
Edit-Resize	n/a	Change size of objects, including DFDs.
Edit-Move	n/a	Reposition objects, including DFDs.
Edit-Copy	n/a	Copy objects, including DFDs.
Edit-Static Attrib	n/a	Change the attributes of an existing static object. Sub-options are:
		Color
		Line Style
		Fill Style
		Font
		All (all of the above)
Edit-DFD Attrib	change-dfd <DFD name>	Edit an existing DFD.
Edit-Layers	n/a	Add the *Layers Display* panel
Edit-Preferences	n/a	Add the *System Preferences* panel for entering specific global system parameters.
Edit-Delete	delete-dfd	Erase an existing object or DFD.
View-Front	n/a	Bring an object to the front (top) of the format.
View-Back	n/a	Send an object to the back (bottom) of the format.
View-View DFDs	update-dfd	Show how DFDs will look in *Sammi*.
View-Preview	n/a	Preview current format.
View-Redisplay	n/a	Redraw all objects in the *Drawing Area*.
Composites Read Composite	read-format -p	Read a grouped set of objects from MDB.
Composites Save Composite	write-part	Save a grouped set of objects to MDB.

Menu option	Command equivalent	Purpose
Dynamic Fields		
Display Palette	add-window $fb-dfdpal	Show the DFD Palette.
Dynamic Fields		
Read DFD Lib	n/a	Read a DFD from the MDB in to current format.
Dynamic Fields		
Save DFD Lib	n/a	Save the dynamic field into the MDB.
Dynamic Fields		
Add DFD	add-dfd	Create a new DFD.
Style-Font	n/a	Add the *Current Font Selection* panel.
Style-Colors...	n/a	Add a panel for selecting a color, either: **Select...** Adds the *Color Selection Display* panel. **Palette...** Adds the *Color Palette* panel.
Style-Line Style	n/a	Add the *Current Line Style* panel.
Style-Fill Style	n/a	Add the *Current Fill Style* panel.
Style-Snap/Grid	n/a	Add the *Current Spacing* panel.
Style-Constraints	n/a	Add the *Line Constraints* panel.
Style-Recolor	n/a	Displays the *Recolor Style* panel.
Help	n/a	Add a help window.

The Drawing Area ($fb-bkgd)

The *Drawing Area* (`$fb-bkgd`) is the “blank canvas” on which you can draw static objects and dynamic fields for new formats. Formats to be changed also appear here for modification.

The size of the *Drawing Area* and the positioning of elements within it correspond exactly to the size and layout of the final *Sammi* window as displayed in the Runtime Environment.

When a format first displays in the Format Editor *Drawing Area*, it is at its maximum size as defined in the *Maximum Width* and *Maximum Height* fields on the *Format Description* panel. The default *Maximum Width* is 610 (pixels) and *Maximum Height* is 400 (pixels). When you zoom in on the format, scrollbars appear on the *Drawing Area*.

Moving panels

To move a panel to a different position, follow these steps:

1. Move the cursor to the name printed in the window manager title bar at the top of the panel.
2. Hold down the mouse SELECT button.
3. Drag the mouse in the direction you want the panel moved. As you move the mouse, an outline of the panel moves across the screen.
4. Release the mouse SELECT button when the outline reaches the desired location. The panel reappears at the new location.

NOTE: Some workstation window managers have a pop-up menu which you access by clicking the mouse OPTION button on either the border or on a button in the upper left corner of a window to move panels. Others may not show a moving outline. Some let you drag any part of the window border. If the above method does not work, please see your window manager manual, or ask your system administrator for instructions.

To change the overlap of a partially obscured panel, click the mouse cursor along the edge of its frame. The obscured panel pops to the front.

NOTE: On some workstations, you must use a pop-up menu to change the overlap. If the above method does not work, please see your workstation manual or window management system documentation for instructions.

Zooming the Drawing Area

When the *Drawing Area* is displayed, you may want to view it in a magnified (zoomed) state. You can do this in one of two ways. The first is by a menu that pops up when you click the mouse OPTION button in the *Drawing Are*a outside of a dynamic field. This menu contains the following options:

Undo	Undoes the last operation.
Redisplay	Redraws the visible format.
Zoom In	Magnifies (zooms) the *Drawing Area* to twice its previously-displayed size. The center of the *Drawing Area* becomes the center of the zoomed area.
Zoom Out	Reduces (demagnifies) the *Drawing Area* to half its previously-displayed size. The center of the previous display is the center of the new display.
Zoom Box	Lets you use a box outline to select an area to zoom on the current display with a box outline. Once you draw the box, the area inside of it is scaled and panned, so that the contents of the box fill the *Drawing Area*. To draw the box, click the mouse SELECT button in the *Drawing Area* where you want the upper-left corner of the box to start, move the cursor down and to the right until the box encompasses the area that you want to zoom, and click the mouse SELECT button again.
Full View	Rescales the format so that the entire format fits in the *Drawing Area*.
Reset Initial	Rescales the format to its initial size.
Reset Maximum	Rescales the *Drawing Area* to its maximum size.
Pan To	Lets you select the center point for panning.
Remove All	Removes everything on the active layer.

The second way to zoom the *Drawing Area* is:

1. In the *Format Editor Control* panel command line, enter the command:

   ```
   add-window zoom
   ```

2. When the *Zoom Format* window appears, move it to an unused area of your display using the procedure described earlier in the section ***Moving panels***.

3. Enter `$fb-bkgd` in the *Format Name* field of the *Zoom Format* window.
   The *Zoompad* on the *Zoom Format* window resizes to the size of the *Drawing Area*.

4. Click the mouse SELECT button on one of the ratio buttons to the left of the *Zoompad* to magnify or demagnify the *Drawing Area.* The ratio buttons are cumulative; that is, if you press the 2:1 button twice, you have effectively magnified the *Drawing Area* to 4 to 1. The ratio buttons are:

2:1	Magnify the outlined area of the format by two times.
4:1	Magnify the outlined area of the format by four times.
8:1	Magnify the outlined area of the format by eight times.
1:2	Shrink the outlined area of the format to half its current size.
1:4	Shrink the outlined area of the format to one fourth it current size.
1:8	Shrink the outlined area of the format to one eighth its current size.
Full	Return the format to its regular size (1:1).

Notes on panning and zooming

You should be aware of the following issues in panning and zooming:

1. To change either the maximum or the initial size of a format, change the *initial* and *maximum* fields in the *Windows Control* section of the *Format Description* panel. This is accessed by choosing the option "Attributes" under "File" on *$fb-cmd* window. (See ***Chapter 4*** for information on these fields.) If you resize the format using the window manager and add objects to the area outside the maximum size, your changes will not be visible unless you increase the *maximum* fields under *height* and *width* of the *Window Control* section on the *Format Description* panel.

NOTE: If you use the area outside the maximum size, you are creating "invisible" objects and DFDs that can cause problems at runtime.

2. The grid is drawn only to the maximum size of the format, even if you *Zoom Out* on the format. This means that sometimes you will not have a grid on the bottom, top, and/or sides of the *Drawing Area*.

3. If you zoom, pan, and resize the *Drawing Area* several times (especially if the aspect ratio is substantially distorted), the cursor coordinates shown in the message line of the *Format Editor Control* panel may stop updating because the cursor is beyond the limits of the maximum size of the format. (See Note 1 above on increasing the maximum size.)

4. The *Reset Maximum* option of the pop-up menu resets the *Drawing Area* to the maximum size (values in the *maximum* fields of the *Window Control* section on the *Format Description* panel) of the format. This is the default when a format is edited in the Format Editor.

5. The *Reset Initial* option on the pop-up menu resets the *Drawing Area* to the initial size (values in the *initial* fields of the *Window Control* section on the *Format Description* panel) of the format. This is the default when a format is displayed in the Runtime Environment.

6. The *Full View* option on the pop-up menu scales the entire format to fit within the current size of the *Drawing Area* with the aspect ratio maintained.

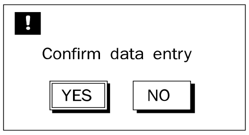
7. Any bitmap and/or GIF images on the format do not scale.

Other visual elements

Other visual elements that appear as you work with the Format Editor are explained below.

Dialog boxes

Occasionally, the Format Editor presents a dialog box that calls your attention to a problem or requires you to take an immediate action. For example:



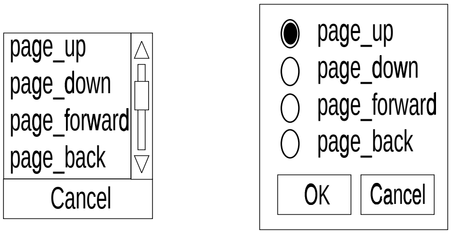
Confirm data entry

Make selections in a dialog box by moving the cursor to the desired response and clicking the mouse SELECT button.

Pop-up option lists

In some cases where the Format Editor requires information entry, it provides a pop-up option list showing all your available choices. To view the list, click on the entry field using the mouse OPTION button. To select from the list, click the mouse SELECT button on the desired selection; to remove the option list without making a selection, click the mouse SELECT button on the *Cancel* button.

You must make a selection or click the mouse SELECT button on the *Cancel* button before you can continue using the Format Editor. Some pop-up lists include an *OK* button on which you must click the mouse SELECT button after making your selection(s).



Scrollable List Box
Option List

Radio Box
Option List

Option List

General guidelines for using the Format Editor

Once you have started the FWDU (Format Editor) from the I_MDB with the panels displayed correctly on the screen, you can begin using it to perform the following operations:

- Create new formats and save them in the MDB.
- View existing formats.
- Change existing formats.
- Copy (Save As) existing formats to the MDB.

General procedures for performing each of these functions are listed on the following pages. Keep in mind that during any work session you can use any of these procedures in any order and as often as desired, as long as your system administrator has provided you with the proper permissions. Procedures for quitting the Format Editor are given at the end of this chapter.

NOTE: The procedures in this section are intended as general guidelines. Since the actual steps you take depend on the format design, we have omitted some details and referred you to later chapters where appropriate. The lessons in ***Chapter 3*** will also repeat many of these steps, but in the context of a specific example.

Creating new formats

Use the following steps each time you want to create a format. You can create any number of separate formats desired during a given work session.

NOTE: Before editing a format one and only one Equipment Constraint End Item has to be created. See “The FWDU Text Editor” on page 365.

1. In the I_MDB create an End Item(EI) of type **FWDU_SYNOPTIC_DISPLAY.**

2. From the I_MDB invoke the newly created EI by selecting the EI and right clicking on it. Then select *Tools* and then *FWDU Editor ...*

3. First time the *Format Description* panel appears. Change the values on the panel as you wish. (See ***Chapter 4*** for details on this panel.)

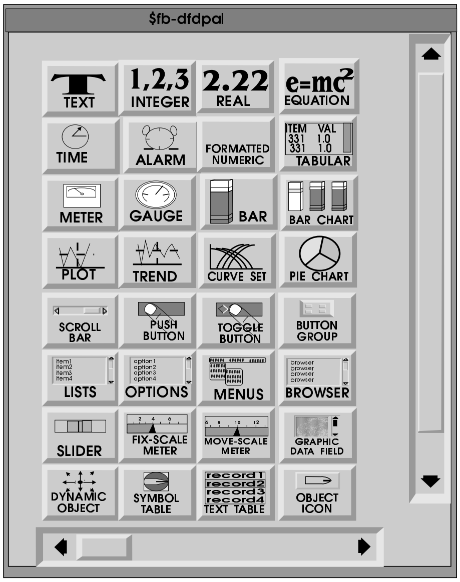
4. Use the *Drawing Tools* buttons to draw all background objects in the format (as explained in ***Chapter 3*** and ***Chapter 5***).

5. Save you work.

Creating dynamic fields (DFDs) with the Icon Palette

Generally, to create dynamic fields:

1. Select the *Display Palette* option from the *Dynamic Fields* menu on the *Format Editor Control* panel. The *DFD Palette* panel displays.



2. Select the type of dynamic field you want to add from the scrollable panel of icons by clicking the mouse SELECT button on an icon.

3. Move the cursor into the *Drawing Area*. The cursor changes to an icon of the selected DFD with a bounding box for the DFD attached only if it is selected from the *DFD Palette* panel.

4. Position the cursor in the desired location and click the mouse SELECT button. The *DFD Display* panel for the selected dynamic field appears with preset values.

5. Make any changes on the *DFD Display* panel that you want.

6. Save each dynamic field by clicking on the *Save DFD* button at the bottom of the *DFD Display* panel.

NOTE: You can continue creating DFDs of the same type by skipping step 2 above. The DFD icon that you selected remains selected until you click the mouse SELECT button on it again or click on another icon.

7. Repeat steps 2, 3, 4, and 5 for each dynamic field created.

8. To end the above process and remove the *DFD Display* panel, click on the *Cancel DFD* button on the bottom of the *DFD Display* panel to close all the panels.

9. To see a static view of the DFDs, select the *View DFDs* option from the *View* menu.

10. To see an animated preview of the DFDs as they will appear in the Run Time Environment, select the *Preview* option from the *View* menu.

Creating dynamic fields (DFDs) with the Add DFD option

Another way to create a DFD is to:

1. Select the *Add DFD* option from the *Dynamic Fields* menu.

2. Move the cursor into the *Drawing Area* to display the *DFD Display* panel. Use the mouse SELECT button to position and draw the desired size DFD.

3. In the *DFD Display* panel, click the mouse OPTION button in the box beside *Display Type* to display a list of DFD types. Select the DFD type by clicking the mouse SELECT button on the name in the list.

To create a duplicate DFD from one that exists:

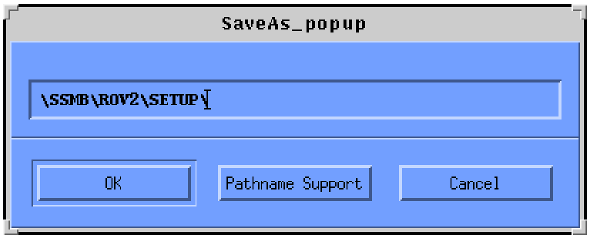
1. Retrieve the DFD using the *DFD Attrib* option on the *Edit* menu. This loads the *DFD Display* panel with the DFD information.

2. Now repeat steps 1 and 2 on creating dynamic fields. The *DFD Display* panel appears with the information from the original DFD.

Saving and testing a format

Once you have created a format with its dynamic fields, you must save and test it.

1. To save the completed format in the MDB, select the *Save* or *Save As...* option from the *File* menu on the *Format Editor Control* panel. The *Save As...* option allows you to save the to format an existing display end item and automatically clears the format from the *Drawing Area*. The Save As pops up the following window.



\SSMB\ROV2\SETUP\

2. Type the Pathname that you want to save to. You can also use Pathname Support (PNS) instead. PNS is an interactive browser where all valid End Items can be seen and selected. Note that only End Items of valid type are shown in the PNS.

NOTE: You can use Preview in the View menu to test and animate your format dynamically.

Viewing or changing existing formats

The previous discussion covered creating a new format. The following steps can be used each time you want to view or modify an existing format. This procedure works whether you have just started the Format Editor or have already used it to create or modify other formats. Remember that this is a general procedure, with references to specific details in later chapters.

1. Select the *Open* option from the *File* menu on the *Format Editor Control* panel. An Open_popup window appears (similar to the SaveAs_popup).
2. Write the Pathname to an End Item of type FWDU_SYNOPTIC_DISPLAY or use Pathname Support for a scrollable list of the existing synoptic display.

3. Click on the *OK* button.

The format appears in the *Drawing Area*.

Viewing and modifying the Format Description panel

To view the *Format Description* panel:

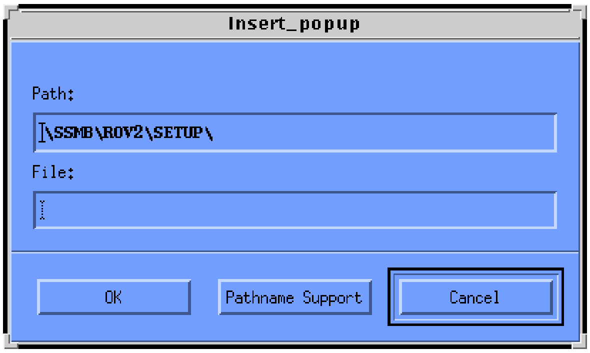
1. Select the *Attributes* option from the *File* menu on the *Format Editor Control* panel. The *Format Description* panel appears.

2. Make any desired changes on the *Format Description* panel (see ***Chapter 4*** for more details).

3. Click the mouse SELECT button on the *OK* button.

Inserting UNIX files into the MDB

To insert a format created with the standard SAMMI into an MDB End Item of type FWDU_SYNOPTIC_DISPLAY, use the *Insert File* in the *File* menu. The following window appears:



Insert_popup

Path: \SSMB\ROV2\SETUP\

File:

1. *Path:* Write the Pathname to the End Item you want the format to be insert in. You can also use the Pathname Support.
2. *File:* Write the complete filesystem path to the file you want to insert.
3. Click the mouse SELECT button on the *OK* button.

Modifying static background objects

To modify static background objects:

Use the *Drawing Tools* buttons on the *Format Editor Control* panel to change static background objects as desired. Most objects are changed by clicking on the appropriate tool button, then clicking the locations in the *Drawing Area* where changes are required (see ***Chapter 5*** for more details).

Modifying dynamic fields (DFDs)

To view or modify dynamic fields:

1. Select the *DFD Attrib* option from the *Edit* menu on the *Format Editor Control* panel.

2. In the *Drawing Area*, move the cursor to the outline of the dynamic field (DFD) that you want to examine or modify and click on it with the mouse SELECT button. The description panels for that DFD appear.

3. After making desired modifications to any of the description panels for the dynamic field, click on the *Save DFD* button at the bottom of the *DFD Display* panel. Clicking on the *Cancel DFD* button will quit dynamic field editing without any modification to the DFD.

4. Repeat steps 2 and 3 for each dynamic field to be modified.

5. Finish dynamic field editing by clicking on the *Cancel DFD* button at the bottom of the *DFD Display* panel.

Other format editing operations

While editing a format, you can perform several editing operations.

Moving static objects

To move a static object or dynamic field:

1. Click the mouse SELECT button on the *Move Tool* button, or select the *Move* option from the *Edit* menu on the *Format Editor Control* panel.

2. Move the cursor to the *Drawing Area* and click the mouse SELECT button on the object to be moved.

3. Move the outline of the object to the location where you want it located, and click the mouse SELECT button again.

Deleting static objects

To delete a static object or a dynamic field:

1. Click the mouse SELECT button on the *Eraser Tool* button, or select the *Delete* option from the *Edit* menu on the *Format Editor Control* panel.

2. Move the cursor to the *Drawing Area* and click the mouse SELECT button on the object to be deleted. It disappears from the screen.

NOTE: If you make a mistake, **immediately** select the *Undo* option on the *Edit* menu, or click the mouse OPTION button and select the *undo* option from the resulting list.

Adding static objects and dynamic fields (DFDs)

Use the *Drawing Tools* buttons to draw all static background objects in the format. Most drawing is done by clicking a *Drawing Tool* button, then clicking at the desired location in the *Drawing Area* (as described in ***Chapters 3*** and ***5***).

To add new dynamic fields (DFDs), see the section ***Chapter 2 General guidelines for using the Format Editor.***

Viewing dynamic fields (DFDs)

If you would like a static view of your dynamic fields to see how they appear, select the *View DFDs* option from the *View* menu.

If you would like an animated preview of your display to see how they appear, select the *Preview* option from the *View* menu.

NOTE: Random values derived from the End Items' definition in the MDB are sent to the dynamic fields so they appear animated.

Copying formats

To create a new format very similar to an existing format, copy the existing format, then modify the copy and save it as a new format. Follow these steps:

1. Open the synoptic display (format) you want to copy.
2. Make any changes desired before saving.
3. Use the *Save As*...functionallity from the *File* menu on the *Format Editor Control Panel* to save the synoptic display in another End Item. You may select an new created FWDU_SYNOPTIC_DISPLAY type End Item or an already existing End Item of same type.

Deleting formats

Use the I_MDB to delete FWDU_SYNOPTIC_DISPLAY's.

Quitting the Format Editor

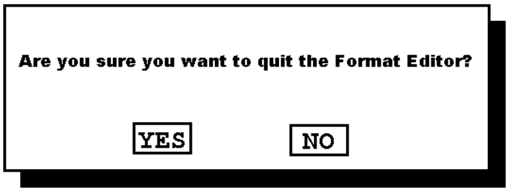
To exit the Format Editor completely:

1. If you have been creating or editing a format and want to save your changes, select the *Save* option from the *File* menu on the *Format Editor Control* panel.
2. Select the *Dismiss* option from the *File* menu on the *Format Editor Control* panel. The *Drawing Area* goes blank.
3. In the command line on the *Format Editor Control* panel, type:

   ```
   quit <RETURN>
   ```

   or

   select the *Exit* option from the *File* menu of the *Format Editor Control* panel. The following dialog box appears:



Are you sure you want to quit the Format Editor?

4. Click the mouse SELECT button on *Yes.*

Learning the Format Editor

Once you understand the Format Editor's basic functions described in the first two chapters, you are ready to practice with working examples. This chapter teaches you how to build a sample format in a series of self-paced lessons. The lessons should be completed in the order presented, without skipping, since each involves components created in previous lessons.

Each lesson is designed to be completed in one session; therefore, do not start a lesson unless you intend to complete it. However, you may quit after any particular lesson and later resume with the next lesson.

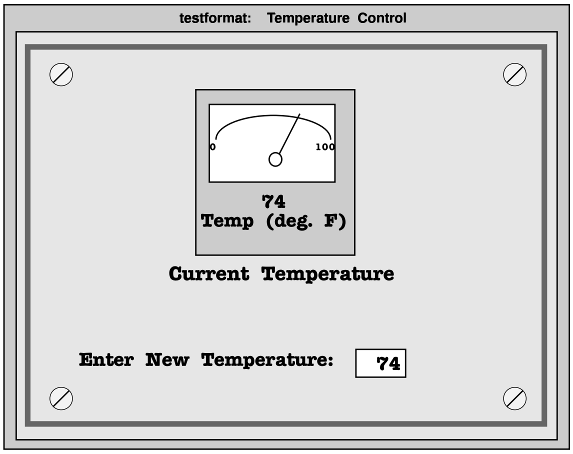
Each of the Format Editor display panels discussed in this chapter is like a standard window that can be moved, resized, or overlapped on most platforms. The following lessons assume you are using a window management system that allows you to manipulate windows dynamically by simple mouse movements such as clicking and dragging.

If you are not using such a window manager, please consult your window system operating manual or System Administrator for correct instructions on moving, resizing, and overlapping windows.

NOTE: If you must stop in the middle of a lesson, save your work by selecting *Save* from the *File* menu on the *Format Editor Control* panel.

About the sample format

All the lessons in this chapter involve the steps for constructing the sample format shown below:



The Sample Format

External look and operation

The sample format is designed to look like a control panel, with a data field and a simulated meter. To heighten the illusion of a control panel, we have included a solid border around the panel and “screws” to hold the panel in place. The *Sammi* user can use the control panel to:

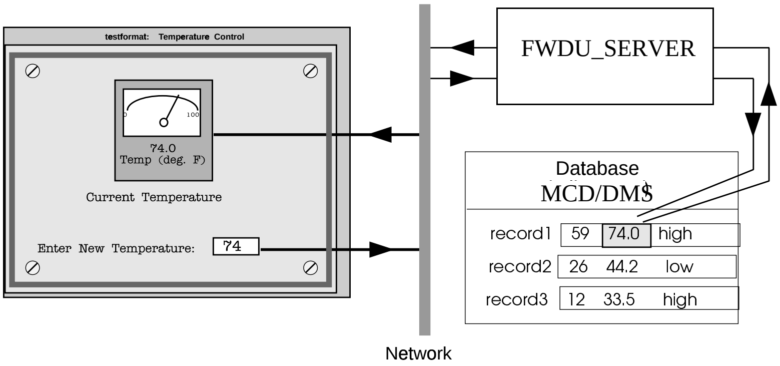
- Enter a new temperature.
- See *Sammi* display the new temperature on the meter.

Naturally, the format does not perform these functions while you are creating it in the Format Editor. You must run the Runtime Environment to test the format. Therefore, the training modules in this chapter teach you not only how to create background objects and data-driven dynamic fields using the Format Editor, but also how to test them in the Runtime Environment.

Internal mechanisms

The external mechanisms listed above are only part of the story. Inside the Runtime Environment are many *internal mechanisms* working to produce the effects seen on the screen.

You must understand these internal mechanisms before you can create truly useful and workable formats.



record1	59	74.0	high
record2	26	44.2	low
record3	12	33.5	high

How the Sample Format Works

The two dynamic fields on the `testformat` format are created using the *Real* and *Meter* display types. For test purposes, both dynamic fields work by accessing the same record element in an MDB. In Run Time Environment the FWDU_SERVER is actually called MCD and this accesses data in the DMS (see illustration above).

The meter accesses the record element in the DMS via the MCD, it reflects new values as soon as its dynamic field is refreshed by the MCD.

The *SAMMI* concept with various data servers and databases has been replaced with one data server: **FWDU_SERVER.** The servername is hidden because there only is the one. Attributes of measurement End Items are sent to the FWDU_SERVER which will send data accordingly.

What you will learn

The lessons in this chapter will lead you step-by-step through a number of procedures that teach the following elements of the Format Editor and the Runtime Environment:

Lesson 1 – Building a format

Part 1 – Starting the FWDU Format Editor

Part 2 – Setting colors and fonts and adding text labels

Part 3 – Changing the font style

Part 4 – Creating a *Real* Dynamic Field Definition (DFD)

Part 5 – Creating a *Meter* Dynamic Field Definition (DFD)

Lesson 2 – Using *Sammi* to test the format

Part 1 – Testing the format

Part 2 – Changing the format and retesting

Lesson 3 – Modifying the format

Part 1 – Changing the format

Part 2 – Setting up default drawing styles

Part 3 – Drawing a border

Part 4 – Drawing background objects

Part 5 – Completing the background

Though this list does not include everything you can possibly learn about the Format Editor and the Runtime Environment, it does provide a comprehensive overview of most of the main features. By following these lessons, you learn quickly how to make a format work in the Runtime Environment.

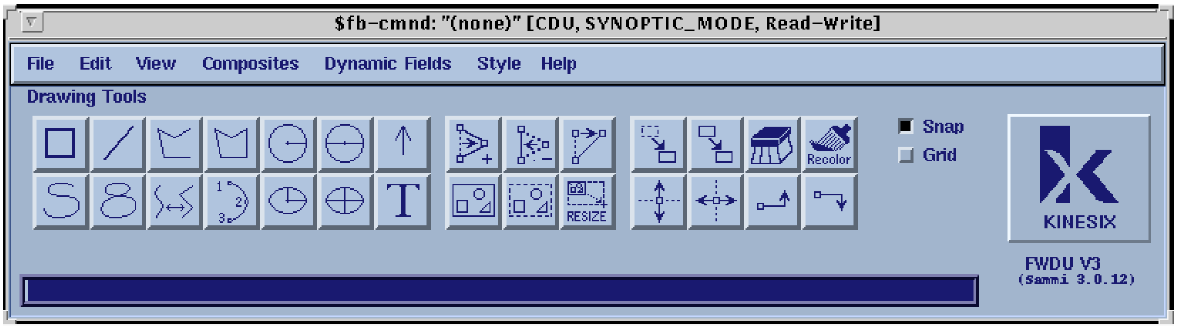
Lesson 1 – Building a format

In the following session, you start the Format Editor and create a format with the basic display elements.

Part 1 – Starting the FWDU Format Editor

1. To start the FWDU invoke a FWDU_SYNOPTIC_DISPLAY End Item from the I_MDB.

   If the FWDU is properly installed on your system, the Format Editor Control panel displays:

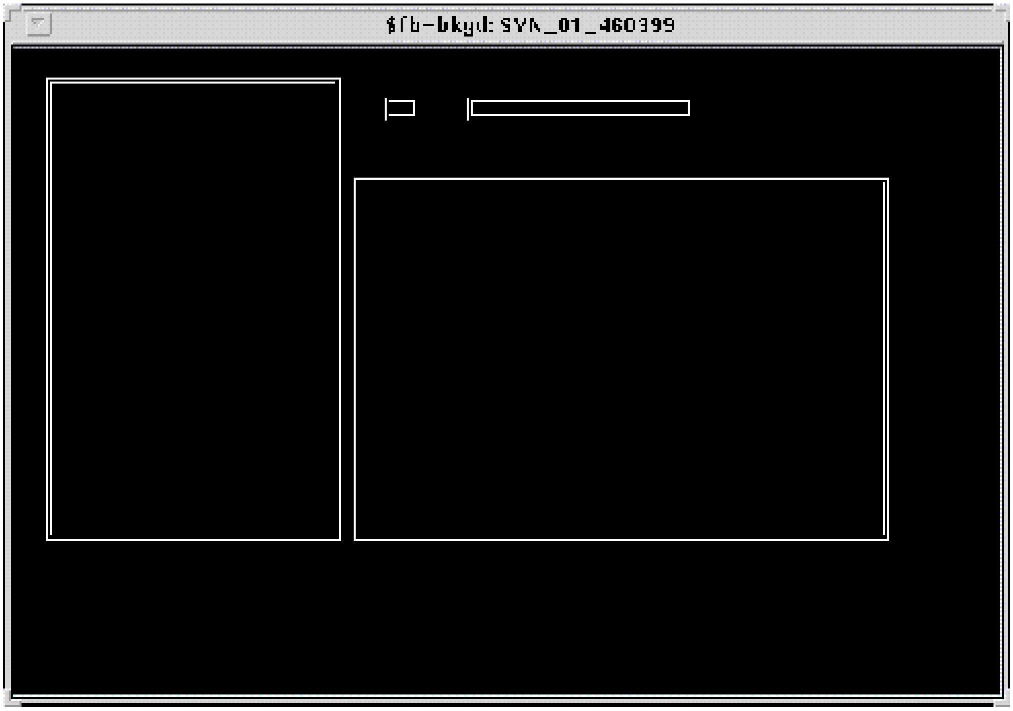


$fb-cmnd: "(none)" [CDU, SYNOPTIC_MODE, Read-Write]

Creating a format

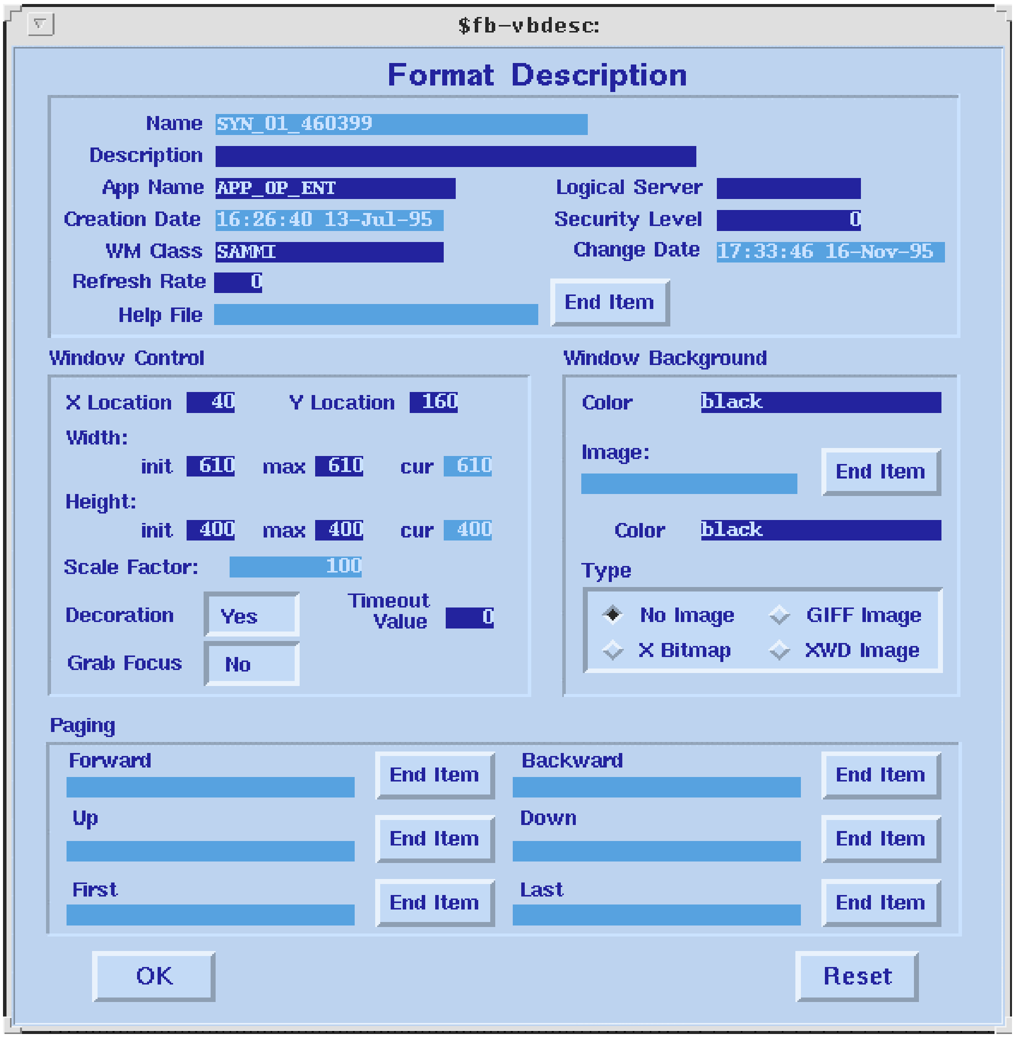
To create a new format:

1. If the invoked FWDU_SYNOPTIC_DISPLAY End Item already has been opened the following *Drawing Area* panel appears. The header holds the name of the FWDU Format Editor specific window *$fb-bkgd* and the SID and the End Item name.



2. If the invoked FWDU_SYNOPTIC_DISPLAY End Item never has been opened the window on the next page appears.

l



$fb–vbdesc:

Format Description

Name: SYN_01_460399
Description:
App Name: APP_OP_ENT
Logical Server:
Creation Date: 16:26:40 13-Jul-95
Security Level: 0
WM Class: SAMMI
Change Date: 17:33:46 16-Nov-95
Refresh Rate: 0
Help File:

Window Control

X Location: 40
Y Location: 160
Width: init 610 max 610 cur 610
Height: init 400 max 400 cur 400
Scale Factor: 100
Decoration: Yes
Timeout Value: 0
Grab Focus: No

Window Background

Color: black
Image:
Color: black
Type: ● No Image ◇ GIFF Image ◇ X Bitmap ◇ XWD Image

Paging

Forward:
Backward:
Up:
Down:
First:
Last:

Entering data in the Format Description pane

NOTE: Most of the parameters on the *Format Description* panel have default values entered. Although most of these are satisfactory for this tutorial, you can change some of their values. For a more detailed discussion of this panel, see ***Chapter 6.***

To describe the format:

1. Enter the following next to *Description* in the *Format Description* panel:

   ```
   Temperature Control
   ```

   This description is displayed in the title bar of the format when you run it in the *Sammi* Runtime Environment.

2. Click the mouse OPTION button on the box to the right of *Color* under *Window Background* to view a list of background colors.

3. Click in the scroll bar track with the mouse SELECT button until you see the *lightsteelblue* label, then click on it with the mouse SELECT button.

4. Adjust the width and height of the format by entering initial and maximum values for each. The default size of a format is 610 pixels wide and 400 pixels high. These values are changed when you adjust the size of the *Drawing Area* in step 2 of the previous section, ***Creating a format***.

   — Under the word *Width* in the *Window Control* section of the *Format Description* panel, enter in the box beside *maximum* the value that is displayed in the box beside *initial.*

   — Under the word *Height* in the *Window Control* section of the *Format Description* panel, enter in the box beside *initial* the value that is displayed in the box beside *maximum.*

NOTE: In the Equipment Constraints a maximum for the *Width* and *Height* is set. For more details see “The FWDU Text Editor” on page 365.

5. Click the mouse SELECT button on

6. the *OK* button at the bottom of the *Format Description* panel. Notice that the *Drawing Area* background color changes to lightsteelblue (as you selected in step 3).

7. Select *Save* from the *File* menu in the *Format Editor Control* panel to save the format in the End Item you invoked. You can also use Save As to store the format in a different End Item.

When you finish the above steps, proceed to the next lesson.

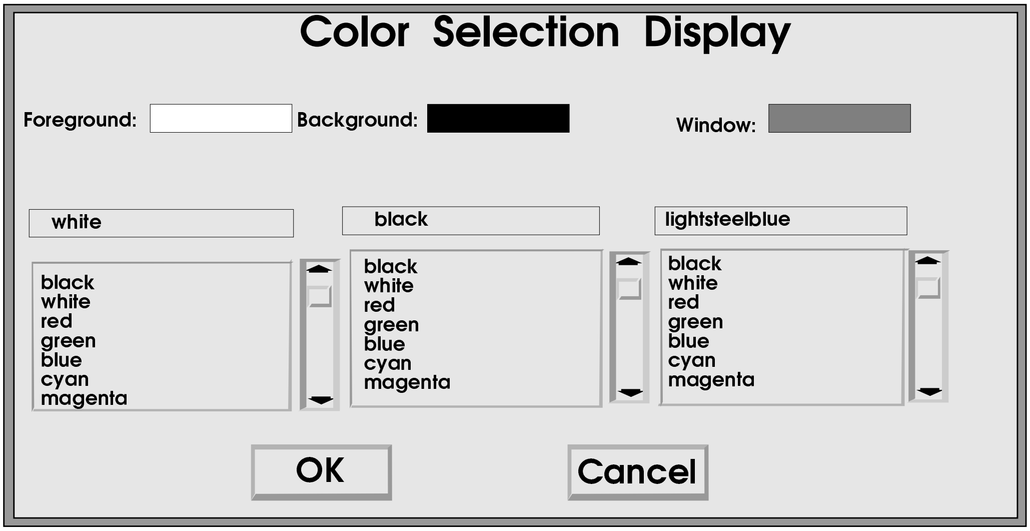
Part 2 – Setting colors and adding text labels

This procedure shows you how to add the first text labels to your drawing. You are only adding two labels at this point; the rest will be added in later lessons. This procedure also explains how to use the color palette to set the foreground color before creating an object and how to “recolor” object attributes. Before starting, make sure you have successfully completed Part 1 of this tutorial.

Setting default colors

To set the default colors:

1. Choose the *Select...* option from the pull-right menu that appears when you select *Colors* from the *Style* menu on the *Format Editor Control* panel to display the *Color Selection Display* panel:



Color Selection Display

Foreground: □ Background: ■ Window: ▨

white

black

lightsteelblue

2. Click the mouse SELECT button in the scrollbar through under *Foreground* until *steelblue* appears. Click the mouse SELECT button on *steelblue*. The patch of color beside the word *Foreground* changes to steel blue.

3. Click the mouse SELECT button in the scrollbar trough under *Background* until *midnightblue* appears. Click the mouse SELECT button on *midnightblue*. The patch of color beside the word “Background” changes to midnight blue.

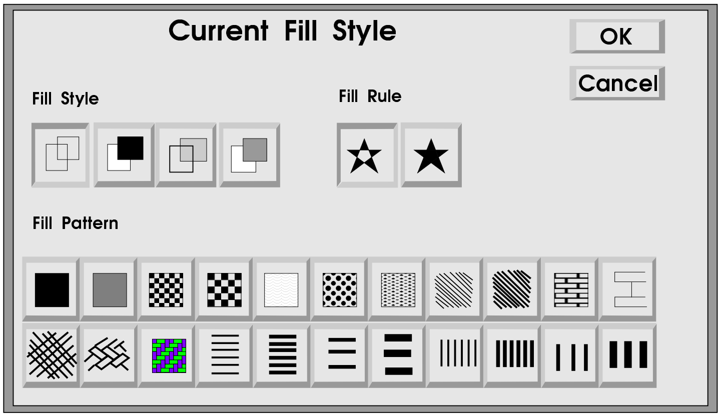
4. Click the mouse SELECT button on the *OK* button to change the current foreground, background, and/or window color, and to close the *Color Selection Display* panel.

5. *Cancel* will close the *Color Selection Display* panel and not change any colors.

Setting the fill pattern

To set the default fill pattern:

1. Select *Fill Style* from the *Style* menu on the *Format Editor Control* panel to display the *Current Fill Style* panel:



2. Click the mouse SELECT button on the *No Fill* button (the two blank overlapping squares at the far left under *Fill Style*). Drawn objects will not hide background objects with this option selected.

3. Click the mouse SELECT button on the *OK* button to close the *Current Fill Style* panel.

Adding text

To add text to the format:

1. Click the mouse SELECT button on the *Text Tool* (*T*) button under *Drawing Tools* on the *Format Editor Control* panel.

2. Move the cursor into the *Drawing Area*. The cursor changes to a pencil shape.

3. Click the mouse SELECT button in the *Drawing Area* just below the center.

4. Enter the following:

   ```
   Current Temperature
   ```

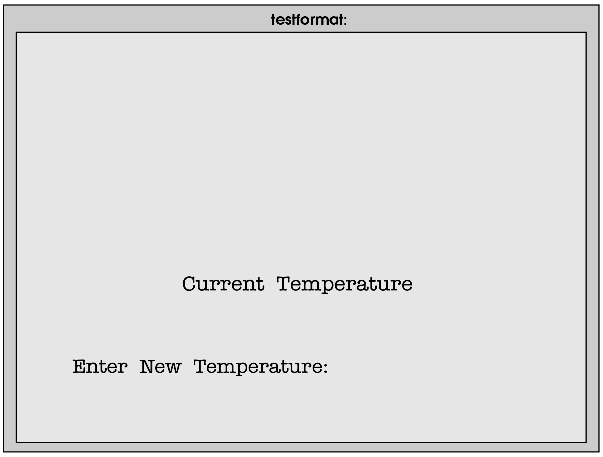
   and press the RETURN key.

5. Move the cursor below these words in the *Drawing Area*.

6. Enter the following:

   `Enter New Temperature:`

   and press the RETURN key.



Current Temperature

Enter New Temperature:

NOTE: If the words you type do not appear, you may have set the foreground and background colors the same, you may have set the *Fill* pattern incorrectly, you may have chosen the wrong tool, or you are not clicking or pressing RETURN correctly.

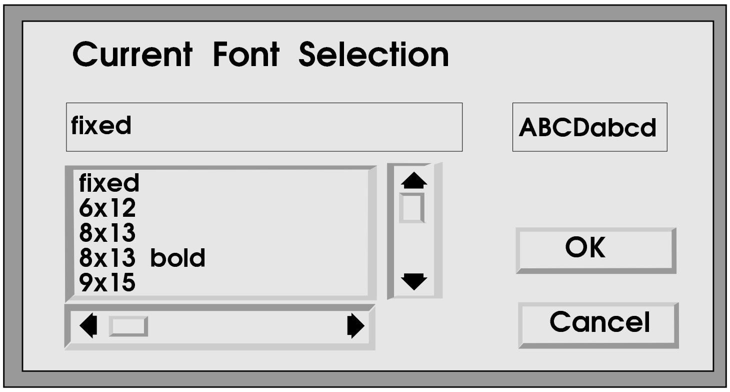
7. Select *Save* from the *File* menu on the *Format Editor Control* panel to save the format.

When you finish the above steps, proceed to the next lesson.

Part 3 – Changing the font style

To change the font of the text you entered in the last part of this lesson:

1. Select *Font* from the *Style* menu on the *Format Editor Control* panel to display the *Current Font Selection* panel.



Current Font Selection

fixed

ABCDabcd

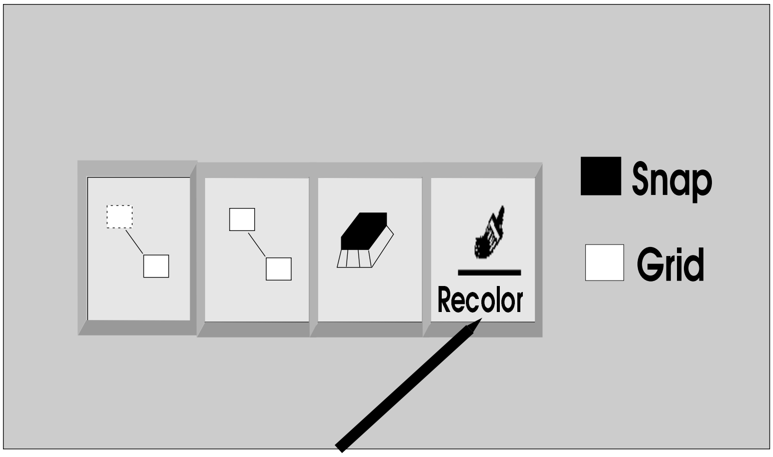
fixed
6x12
8x13
8x13 bold
9x15

2. When the list of fonts appears scroll through the list to find the entry for “courier bold 18pt.”

3. Click the mouse SELECT button on this entry.

4. Click the mouse SELECT button on the *OK* button to close the *Current Font Selection* panel.

5. Click the mouse SELECT button on the *Recolor Tool* button on the top row, far right under *Drawing Tools* of the *Format Editor Control* panel. This sets the recoloring function by which you can change the color or appearance of drawn objects or the font of text.



The Recolor Tool

6. Move the cursor into the *Drawing Area*. The cursor changes to a cross.

7. Click on the two text strings you just created inside the *Drawing Area*. Each one should change to the new font.

NOTE: If you have made errors, click the mouse SELECT button on the *Eraser Tool* (immediately to the left of the *Recolor Tool*), then move the cursor to the *Drawing Area*, and click the mouse SELECT button on any object (or text) you want to erase.

8. Select *Save* from the *File* menu on the *Format Editor Control* panel to save the format.

Part 4 – Creating a Real Dynamic Field Definition (DFD)

This procedure lets you add the first dynamic field to the `testformat` format. This discussion is broken into several subsets to cover the three different panels that you must complete. Before starting, make sure you have successfully completed all previous parts of this lesson. (You should have the `testformat` format displayed.)

1. Select *Add DFD* from the *Dynamic Fields* menu in the *Format Editor Control* panel.

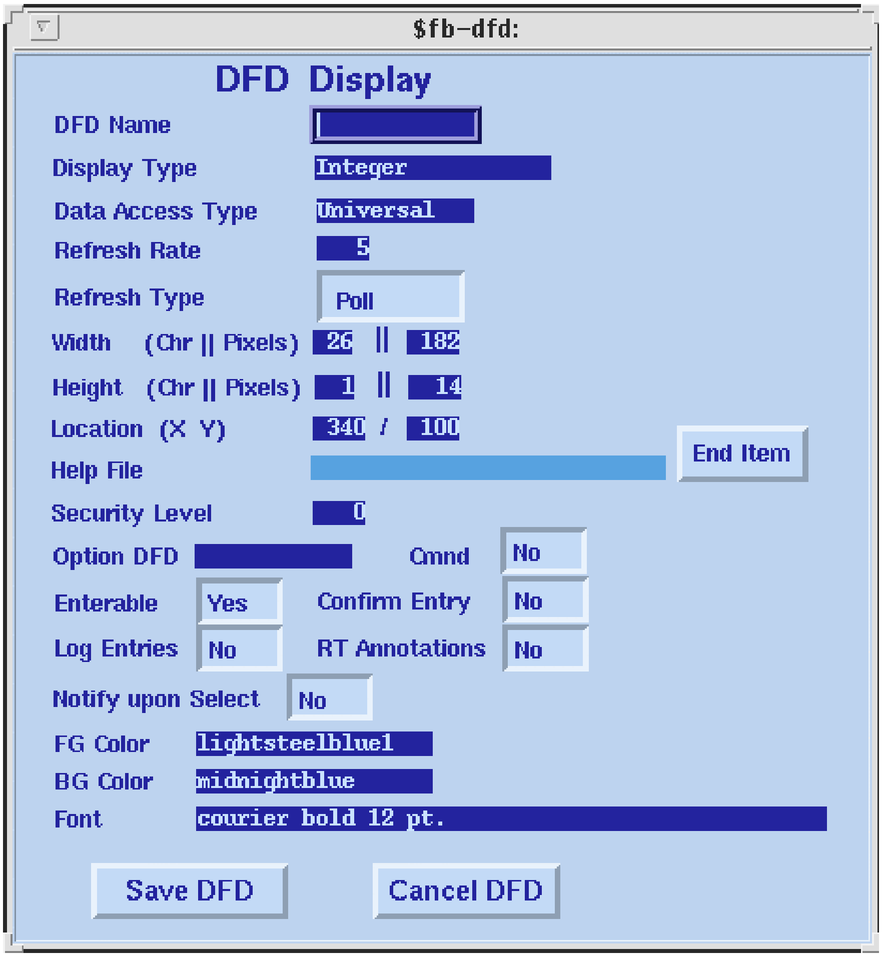
2. In the *Drawing Area*, click the mouse SELECT button to the right of the text string “Enter New Temperature:”

3. Move the mouse toward the lower right. As you do so, notice the borders of the dynamic field now appear as an expanding box, and the *DFD Display* panel appears.

4. While expanding the box, also notice the values beside *Width* and *Height* on the *DFD Display* panel are changing. When the value in the box to the right of *Width* shows 4 characters (Chr) and the value in the box to the right of *Height* shows 1 character (Chr), click the mouse SELECT button again. If you cannot get them adjusted with the mouse, enter them manually (see next section).

Entering data on the DFD Display panel

To enter data on the *DFD Display* panel:



$fb-dfd:

DFD Display

DFD Name

Display Type: Integer

Data Access Type: Universal

Refresh Rate: 5

Refresh Type: Poll

Width (Chr || Pixels): 26 || 182

Height (Chr || Pixels): 1 || 14

Location (X Y): 340 / 100

Help File

Security Level: 0

Option DFD

Cmnd: No

Enterable: Yes

Confirm Entry: No

Log Entries: No

RT Annotations: No

Notify upon Select: No

FG Color: lightsteelblue1

BG Color: midnightblue

Font: courier bold 12 pt.

1. Click to the right of *DFD Name* and enter the name *inputemp*. (Do not press the RETURN key.)

2. Either press the TAB key or click the mouse OPTION button in the box to the right of *Display Type* and select *Real* from the resulting option list. The *Real Display* panel appears. Stay on the *DFD Display* panel.

3. Click the mouse OPTION button in the box to the right of *Data Access Type* and select *Universal* from the resulting option list. The *Data Access Description* panel appears. Stay on the *DFD Display* panel.

4. Enter *5* in the box to the right of *Refresh Rate*. This sets the amount of time that will elapse before the data redisplays (in this case, 5 seconds).

5. Click the mouse SELECT button in the boxes to the right of *Enterable* and *Confirm*

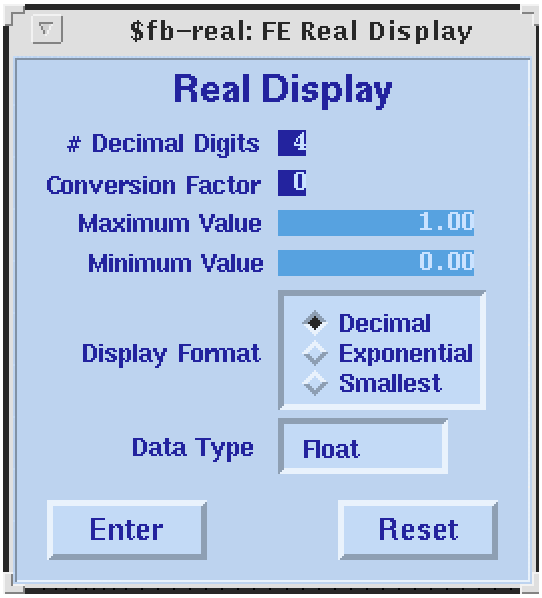
Entry to toggle both to *Yes*. This allows users to enter data and verify the entry.

6. In the box to the right of *Font*, click the mouse OPTION button and select “courier-bold 18pt.,” then click the mouse SELECT button to set the font for the *Real* DFD.

WARNING: Do **NOT** click on the *Save DFD* or *Cancel DFD* button yet.

The Real Display Panel

Now move the cursor to the *Real Display* panel:



$fb–real: FE Real Display

Real Display

Decimal Digits 4

Conversion Factor 0

Maximum Value 1.00

Minimum Value 0.00

Display Format ◆ Decimal ◇ Exponential ◇ Smallest

Data Type Float

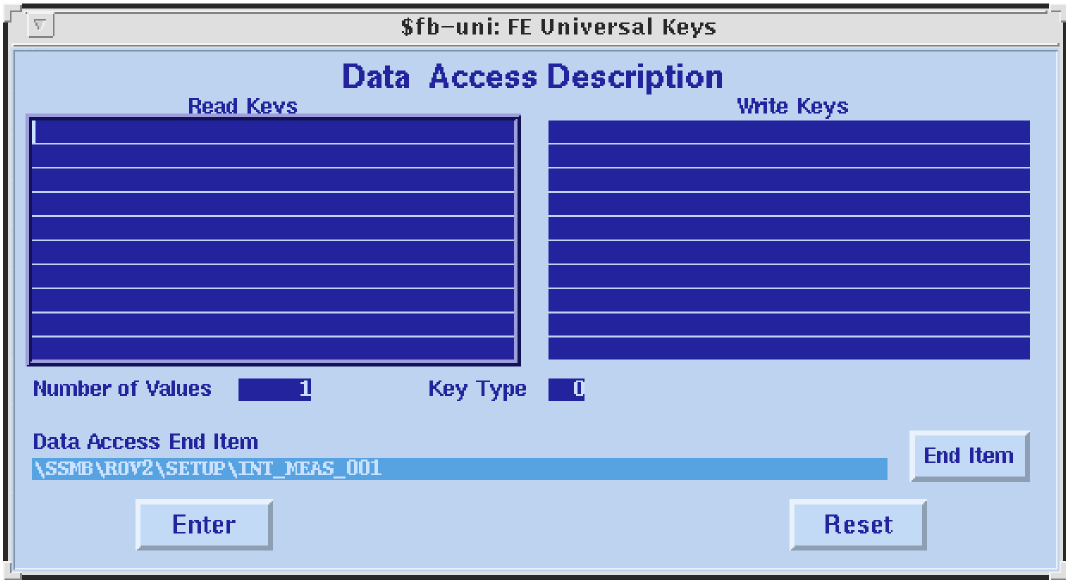
Observe the lightblue color of the *Maximum* and *Minimum* value fields. In the FWDU this means that the values are *read-only*.The values are taken from the attached End Item. Also the Data Type is taken from the attached End Item. because the FWDU can read information about End Items from the MDB several values can be filled automatically. This also means that the values can not be changed using the FWDU. You will have to use the I_MDB to change these values. For more details on the Real Display see “Real” on page 351.

WARNING: Do **NOT** click on the *Save DFD* or *Cancel DFD* button yet.

Attaching MDB End Items as Data Sources

NOTE: In the FWDU the Data Access Description Panel sets up a communication link between FWDU_SERVER (started automatically at preview) and the SAMMI Runtime Environment. This is done implicitly without need for user interaction. This can be done because the end data server is known and well defined.

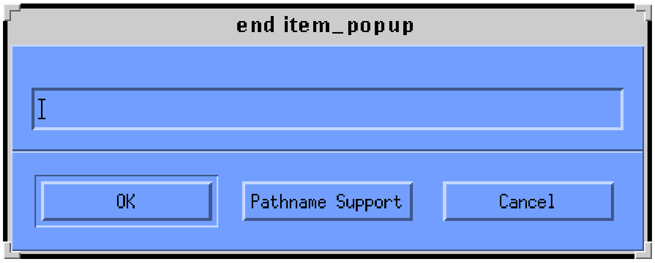
Now move the cursor to the *Data Access Description* panel:



Number of Values 1
Key Type 0
Data Access End Item \SSMB\ROV2\SETUP\INT_MEAS_001

The FWDU does not use read keys nor write keys. Instead it uses a read-only field, Data Access End Item, to record attachment of MDB measurement End Items:

1. Press the End Item button. The following window appears:



2. The MDB Pathname is prefixed with a best guess (Current CCU/CDU). Complete the Pathname (a measurement End Item). As a help you could use Pathname Support instead.

3. Press OK button. As a result the Data Access End Item field is filled with the specified End Item.

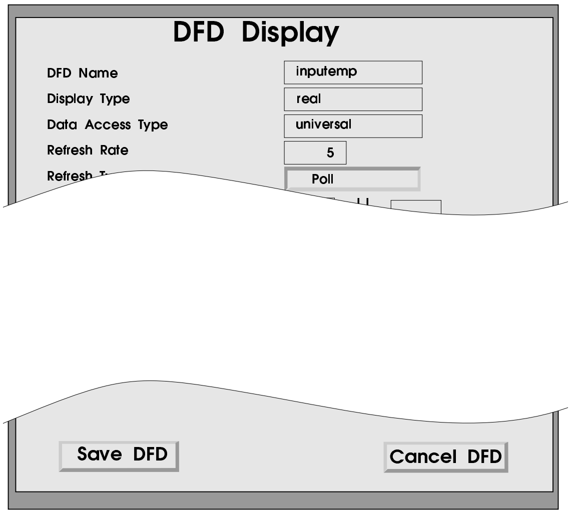
When attaching an End Item the existence of the End Item is verified. Only End Items in the current scope (CCU/CDU) can be attached. If the End Item is found the type of the End

Item - which is found automatically in the MDB - is checked to make sure that the End Item's type is compatible. If errors are found then the End Item is not accepted and the dialogue is not closed.

NOTE: At preview the maximum and minimum attributes of the measurement End Items are sent to the data server automatically.

Completing the data entry process for the Real DFD

Now move the cursor to the *DFD Display* panel:



DFD Display

DFD Name: inputemp
Display Type: real
Data Access Type: universal
Refresh Rate: 5
Refresh T: Poll

1. Click the mouse SELECT button on the *Save DFD* button on the *DFD Display* panel to save the dynamic fields. Once you do this, the background of the DFD reverts to the background color of the rest of the format.

2. Click the mouse SELECT button on the *Cancel DFD* button to clear the extra panels from the screen.

NOTE: When you click on the *Save DFD* button, the dynamic field becomes an outline of the DFD. To see how the dynamic field actually looks, select *View DFDs* from the *View* menu on the *Format Editor Control* panel.

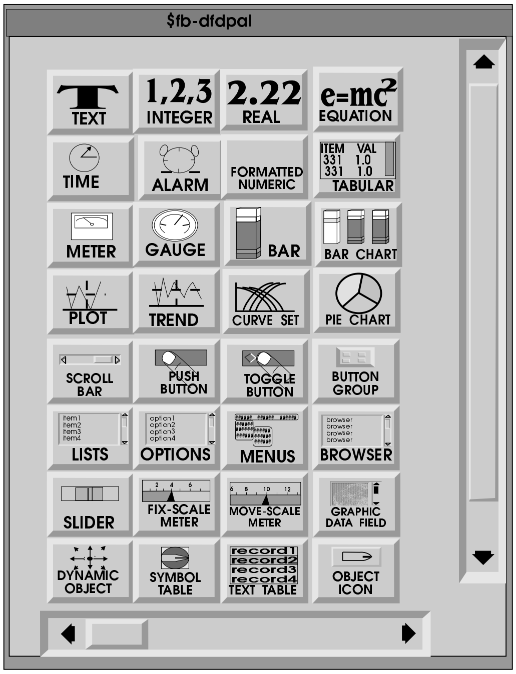
3. Select *Save* from the *File* menu in the *Format Editor Control* panel to save your format.

When you completed the above steps, proceed to the next lesson.

Part 5 – Creating a Meter Dynamic Field Definition (DFD)

In this part, you will add a second dynamic field to the `testformat` format. This part is broken into several subparts to cover the three different panels that you must complete. Before starting, make sure you have successfully completed all previous parts of this lesson and that you have the `testformat` format displayed in the *Drawing Area*.

1. Select *Display Palette* from the *Dynamic Fields* menu on the *Format Editor Control* panel. The *Display Palette* panel appears.



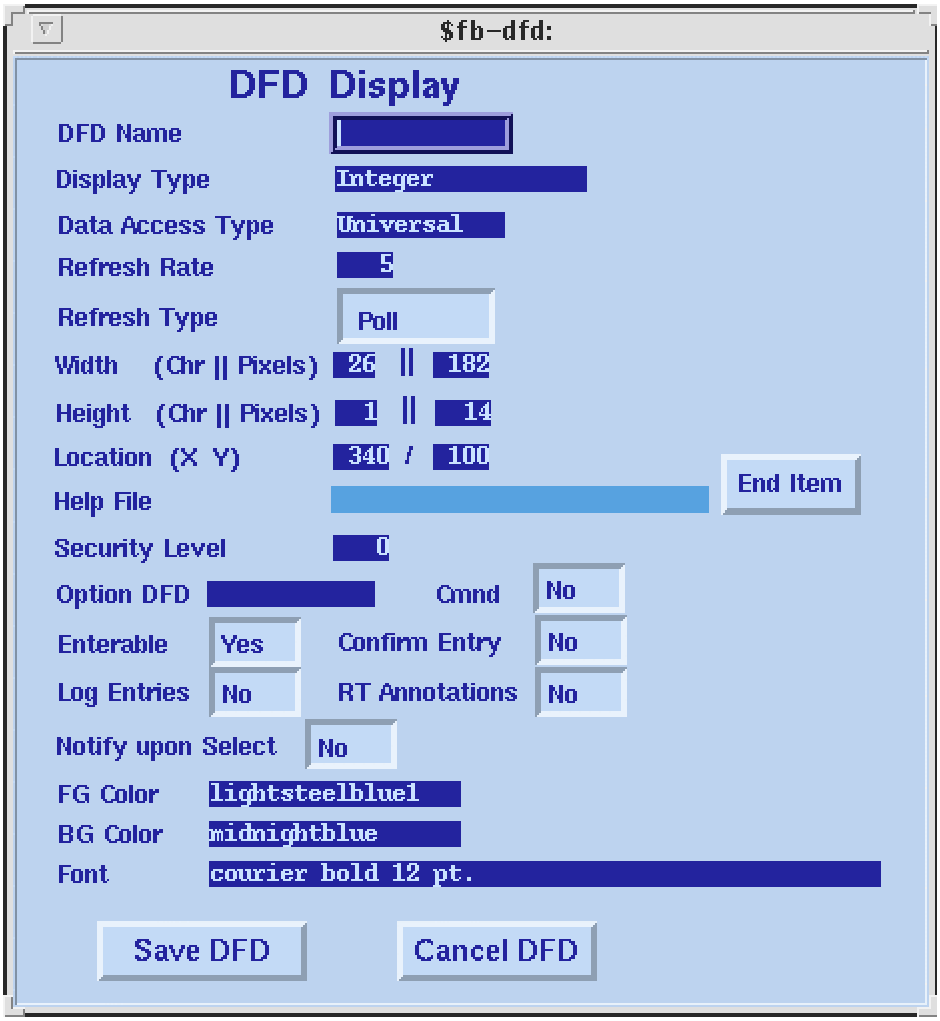
2. Click the mouse SELECT button on the *Meter* icon. (You may have to scroll through the *Display Palette* panel to see the *Meter* button.) The *Meter Display* and the *Data Access Description* panels appear.

3. Move the cursor into the *Drawing Area*. The cursor turns into a Meter icon attached to a DFD outline box.

4. Move the *Meter* icon to the upper-left side of the *Drawing Area* so that its upper-left corner is near the ruler on the top line at the one-inch mark, then click on the mouse SELECT button. This positions the *Meter* DFD.

Entering data on the DFD Display Panel

Now move the cursor to the *DFD Display* panel:



$fb-dfd:

DFD Display

DFD Name

Display Type: Integer

Data Access Type: Universal

Refresh Rate: 5

Refresh Type: Poll

Width (Chr || Pixels): 26 || 182

Height (Chr || Pixels): 1 || 14

Location (X Y): 340 / 100

Help File

Security Level: 0

Option DFD

Cmnd: No

Enterable: Yes

Confirm Entry: No

Log Entries: No

RT Annotations: No

Notify upon Select: No

FG Color: lightsteelblue1

BG Color: midnightblue

Font: courier bold 12 pt.

1. Enter the word *testmeter* in the box next to *DFD Name*. Do not press the RETURN key yet.

2. Either press the TAB key or click the mouse SELECT button in the box to the right of *Refresh Rate* and enter 5. This sets the time between field refreshes to 5 seconds.

3. Either press the TAB key or click the mouse SELECT button in the box to the right of *Refresh Type* to toggle to *Poll*. This sets the way the network checks for refreshing. Poll means that data is read at certain intervals. When set to stream the dataserver only sends data when needed. You can not see and difference when previewing.

4. Either press the TAB key or click the mouse SELECT button in the box to the right of *Width* (in pixels) and enter 350. This sets the width of the area for the meter.

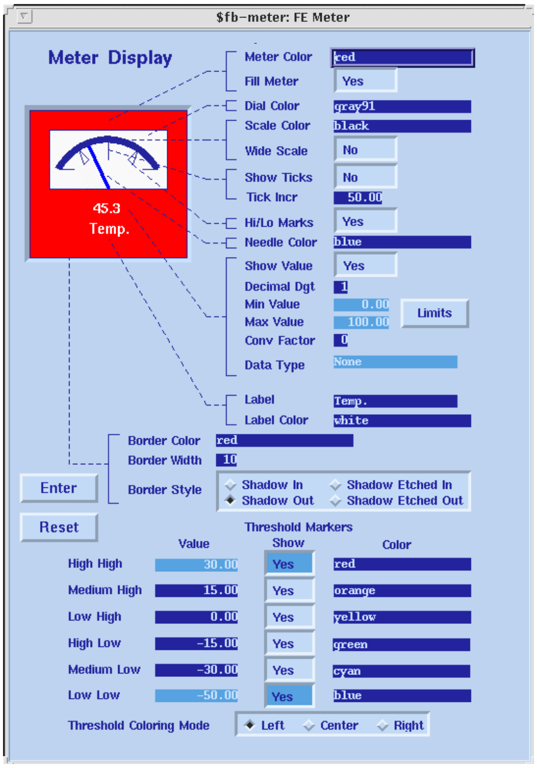
5. Either press the TAB key, or click the mouse SELECT button in the box to the right of *Height* (in pixels), and enter 250. This sets the height of the area for the meter.

NOTE: You can change the size of any DFD at any time by clicking the mouse SELECT button on the *Resize Tool* button on the *Format Editor Control* panel. Then click the mouse SELECT button on the corner of the outline of the DFD you want to resize, and move the cursor to adjust the DFD to the desired size and click the mouse SELECT button again.

6. Either press the TAB key, or click the mouse SELECT button in the box to the right of *Enterable* to toggle to *No*. This DFD is *display-only*.

Entering data on the Meter Display Panel

Now move the cursor to the *Meter Display* panel and follow the steps listed below:



$fb−meter: FE Meter

Meter Display

Meter Color: red
Fill Meter: Yes
Dial Color: gray91
Scale Color: black
Wide Scale: No
Show Ticks: No
Tick Incr: 50.00
Hi/Lo Marks: Yes
Needle Color: blue
Show Value: Yes
Decimal Dgt: 1
Min Value: 0.00
Max Value: 100.00
Conv Factor: 0
Data Type: None
Label: Temp.
Label Color: white
Border Color: red
Border Width: 10
Border Style: ○ Shadow In ● Shadow Out ○ Shadow Etched In ○ Shadow Etched Out

Threshold Markers

	Value	Show	Color
High High	30.00	Yes	red
Medium High	15.00	Yes	orange
Low High	0.00	Yes	yellow
High Low	-15.00	Yes	green
Medium Low	-30.00	Yes	cyan
Low Low	-50.00	Yes	blue

Threshold Coloring Mode: ● Left ○ Center ○ Right

1. Click the mouse SELECT button in the box to the right of *Show Value* to toggle to *Yes*.This tells *Sammi* to display the numeric value that is represented on the meter in digital from below the meter.

2. Enter *Temp (deg. F)* in the *Label*. This provides a label for the meter when it appears in the Runtime Environment.

NOTE: As previously described the type of the meter is automatically determined.

3. Click the mouse SELECT button in the box to the right of *Show Ticks* to toggle to *Yes*. This tells *Sammi* to display the tick marks on the meter.

All other entries on this panel are acceptable; however, you may select new colors for the meter, dial, scale, etc., from pop-up option lists that appear when you click the mouse OPTION button in the appropriate boxes.

WARNING: Do **NOT** click on the *Save DFD* or *Cancel DFD* button yet.

Completing the data entry process for the Meter DFD

Now move the cursor to the *DFD Display* panel and:

1. Enter an End Item on the Data Access Description Panel as described in section “Attaching MDB End Items as Data Sources” on page 66.

2. Click the mouse SELECT button on the *Save DFD* button at the bottom of the *DFD Display* panel.

3. Click the mouse SELECT button on the *Cancel DFD* button to clear the extra panels.

NOTE: Before you perform the following step, you may want to reposition your DFD. You do this by clicking on the *Move Tool* button on the *Format Editor Control* panel, then moving the cursor into the *Drawing Area*, and clicking on the DFDs you want to move.

4. Select *Save* from the *File* menu in the *Format Editor Control* panel to save the format.

5. Select *Dismiss* from the *File* menu in the *Format Editor Control* panel to clear the format from the *Drawing Area.*

6. Select *Exit* from the *File* menu in the *Format Editor Control* panel to quit the FWDU.

Lesson 2 – Using *Sammi* to test the format

Part 1 – Testing the format

To test the format:

1. Invoke the FWDU_SYNOPTIC_DISPLAY End Item from the I_MDB, which has

attached measurement End Items to the various DFD’s.

2. Select *Preview* from the *View* menu. A new window will now appear showing the display as it will look when running together with the MCD. he data values are of cause not real data but random values generated by the FWDU_SERVER.

Part 2 – Changing the format and retesting

This procedure explains how to change an existing format and simultaneously test it in the Runtime Environment. At this point, you should already have the Format Editor started with the respective windows displayed on the screen. Before continuing, make sure you have successfully finished Part 1 of this lesson.

1. Stop the current preview. (Quit the window.)

2. Select *DFD Attrib* from the *Edit* menu and click on a DFD you would like to change.

3. Modify the values you want and save the DFD.

4. Preview again by selecting *Preview* in the *View* menu.

Lesson 3 - Drawing static background objects

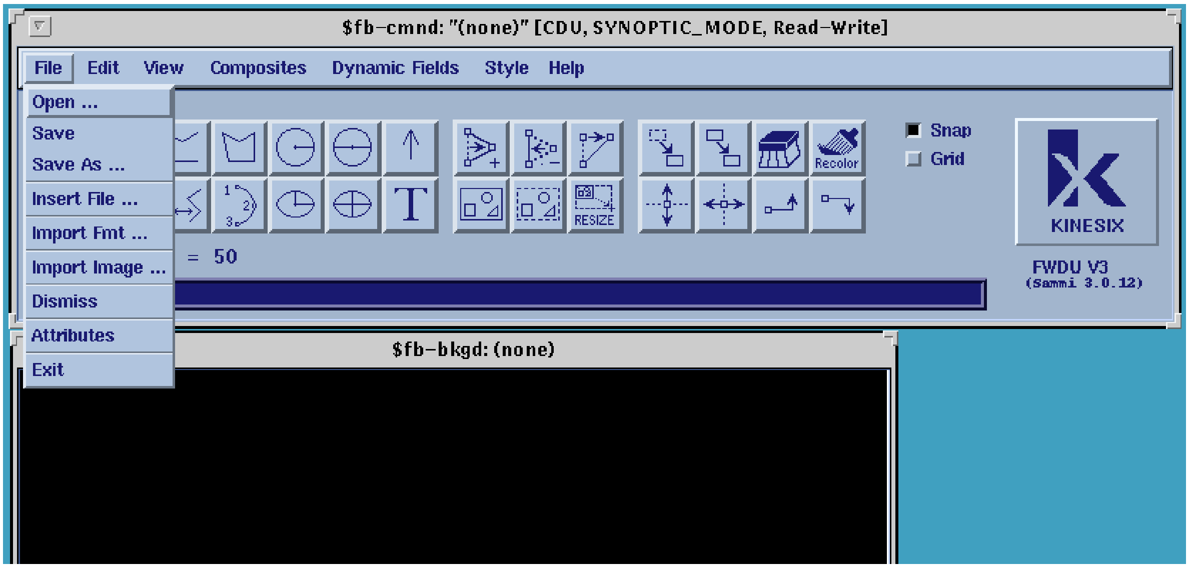
The following lesson allows you to draw static background objects that will make the display look like a control panel. These include a rectangular “facing plate” with “screws” placed at each corner. Do not worry if the elements do not line up perfectly the first time. Before you complete the lesson, you will learn how to reshape and realign all the display components.

Before starting this lesson, make sure the Format Editor is started with the *Format Editor Control* panel displayed on the screen (if it is not, see ***Chapter 2 Getting Started***).

Part 1 – Changing the format

This procedure explains how to bring up the format created in Lesson 1, so that you can begin making changes to it. Before continuing, make sure you have successfully completed all parts of Lesson 1 earlier in this chapter.

1. Select *Open* from the *File* menu on the *Format Editor Control* panel.



2. Enter an appropriate MDB Pathname of a FWDU_SYNOPTIC_DISPLAY type End Item and press *OK*.

3. The FWDU_SYNOPTIC_DISPLAY type End Item appears in the *Drawing Area*.

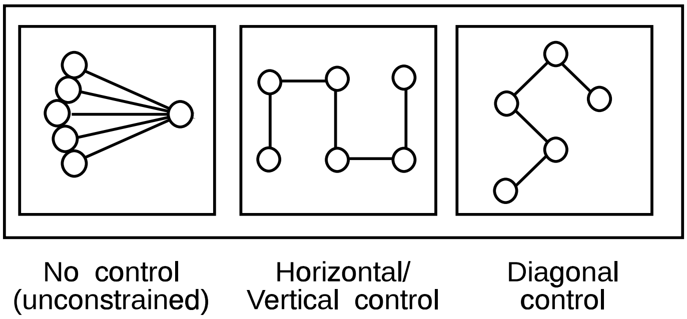
Part 2 – Setting up the default drawing styles

These procedures explain how to set up the default styles that will be used for drawing background objects later in this lesson. Before starting, make sure you have successfully completed Part 1 of this lesson.

Setting the line orientation

To set the line orientation:

1. Select *Constraints* from the *Style* menu on the *Format Editor Control* panel. The *Line Orientation* panel appears.



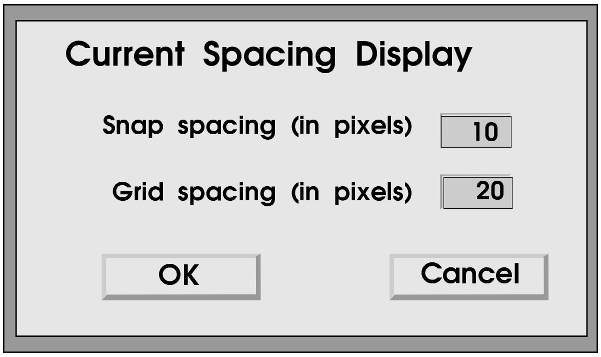
2. Select the first button (*No control*) from the *Line Orientation* panel.

3. Click the mouse SELECT button on the *OK* button to close the panel.

Setting the Snap/Grid function

To set the Snap and Grid spacing, turn these functions on:

1. Select *Snap/Grid* from the *Style* menu on the *Format Editor Control* panel. The *Current Spacing Display* panel appears.


Current Spacing Display

Snap spacing (in pixels) 10

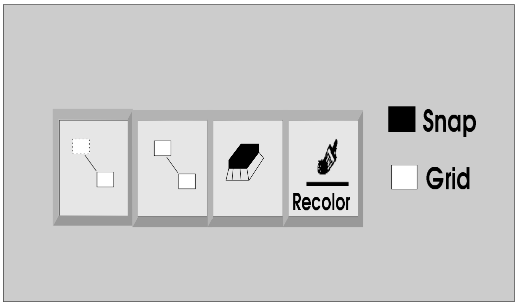
Grid spacing (in pixels) 20

2. Enter 10 in the box to the right of *Snap spacing* (in pixels) on the *Current Spacing Display* panel.

3. Enter 20 in the box to the right of *Grid spacing* (in pixels) on the *Current Spacing Display* panel.

4. Click the mouse SELECT button on the *OK* button to close the panel.

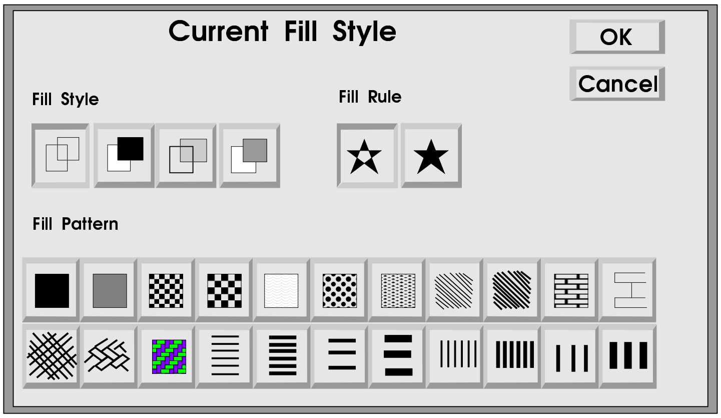
5. Click the mouse SELECT button on the *Grid* and the *Snap* buttons (on the far right side of the *Format Editor Control* panel).



Setting the fill style

To set the current fill style:

1. Select *Fill Style* from the *Style* menu on the *Format Editor Control* panel. The *Current Fill Style* panel appears.



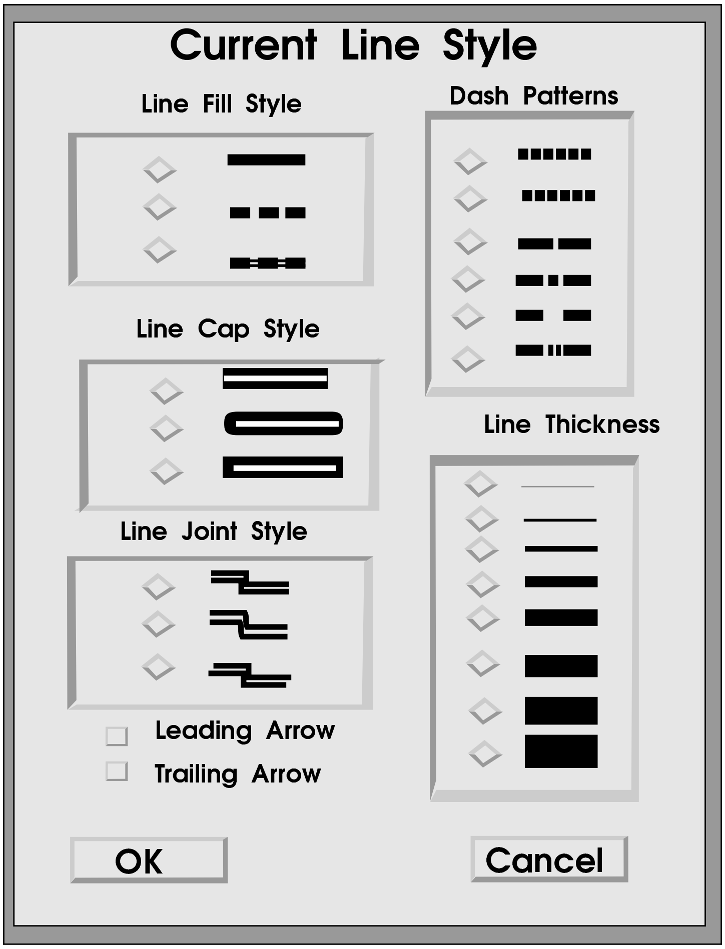
2. Select the first button from the left (*No Fill*) from the *Current Fill Style* panel.

3. Click the mouse SELECT button on the *OK* button to close the panel and to choose the fill style, rule, and/or pattern selected.

Setting the line style

To set the current line style:

1. Select *Line Style* from the *Style* menu on the *Format Editor Control* panel. The *Current Line Style* panel appears.



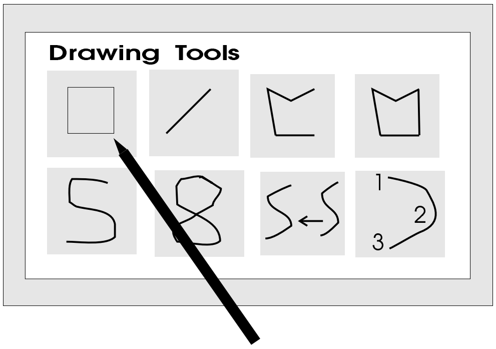
2. Select the top symbol under *Line Fill Style* in the upper left side of the panel and the fifth symbol under *Line Thickness* on the lower right side of the panel.

3. Click the mouse SELECT button on the *OK* button to close the panel and to choose the *Line Fill Style*, *Cap Style*, etc.

Part 3 – Drawing the “facing plate”

This procedure explains how to create a “facing plate” for the format. Before starting, make sure you have successfully completed the previous parts of this lesson.

1. Click on the *Box Tool* button (top left under *Drawing Tools* on the *Format Editor Control* panel).

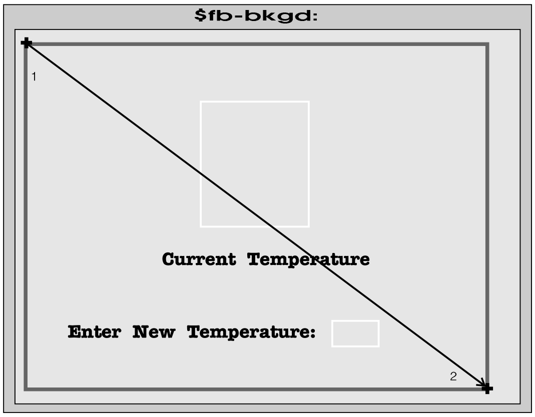


Box Tool

2. Move the cursor to the top left corner inside the *Drawing Area* and click the mouse SELECT button to set the upper left corner of the facing plate.

3. Move the cursor to the lower right corner of the *Drawing Area*.

4. Click the mouse SELECT button when the box outline is large enough to encompass all the dynamic fields and text created so far.



Drawing the Facing Plate

The box is drawn. It does not need to be perfect at this point. You will be able to realign the box later in this lesson.

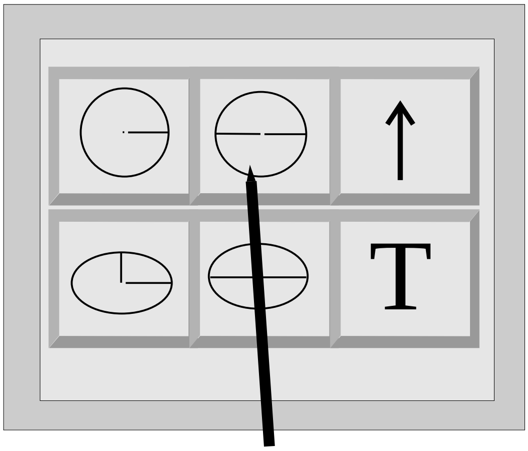
5. Select *Save* from the *File* menu in the *Format Editor Control* panel to save the format.

When you finish the above steps, continue to the next procedure.

Part 4 – Drawing the background objects

This procedure explains how to create one of the "screws" shown in the sample format. Before starting, make sure you have successfully completed all previous parts of this lesson.

1. Click the mouse SELECT button on the *Circle by Diameter Tool* button (first row under *Drawing Tools* on the *Format Editor Control* panel).



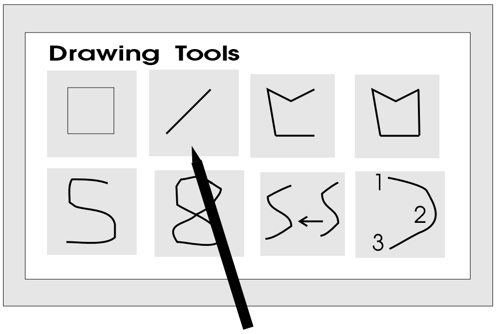
Circle-by-Diameter Tool

2. Move the cursor to the *Drawing Area* and position it to the upper-left corner of the previously drawn facing plate.

3. Click the mouse SELECT button once. Move the cursor slowly toward the lower right and watch the expanding circle enlarge.

4. Click the mouse SELECT button again once a small circle of approximately 1/2 inch (20 pixels) diameter has formed.

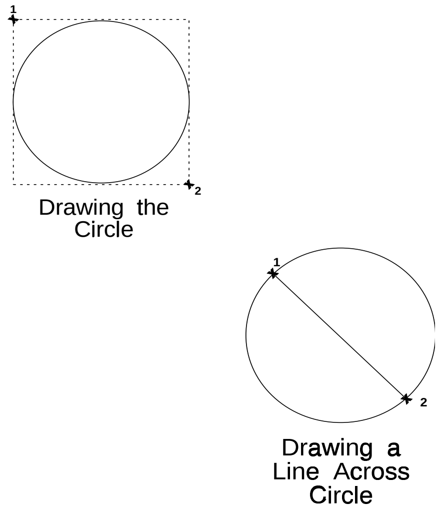
5. Click the mouse SELECT button on the *Line Tool* (top row under *Drawing Tools* on the *Format Editor Control* panel).



Line Tool

6. Click the mouse SELECT button once on the upper left circumference of the circle drawn in the step above.

7. Extend the rubberband line diagonally across the circle and click the mouse SELECT button again on the lower right circumference of the circle.



Circle/Line Click Points

At this point, your drawing should have one small circle in it with a diagonal line that makes it look like the head of a screw. If not, repeat the previous steps until the "screw" is drawn correctly. If necessary, you can erase the line or circle using the *Eraser Tool* (first row, second from right under *Drawing Tools* on the *Format Editor Control* panel) and start over.

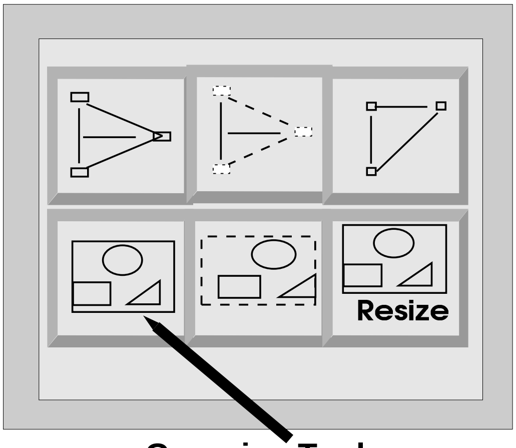
8. Select *Save* from the *File* menu in the *Format Editor Control* panel to save the format.

When you finish the above steps, proceed to the next lesson.

Part 5 – Finishing the background

This procedure allows you to finish drawing the background by coloring, copying, and realigning objects. Before starting, make sure you have successfully completed all previous parts of this lesson.

1. Click the mouse SELECT button on the *Grouping Tool* (second row, middle under *Drawing Tools* on the *Format Editor Control* panel).

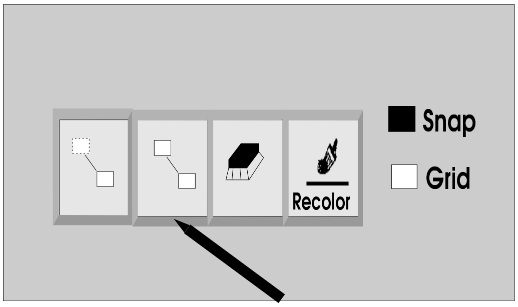


Grouping Tool

2. Click the mouse SELECT button just to the upper left of the screw shown in the *Drawing Area*.

3. Draw the expanding box down across the screw until it is completely enclosed, then click again. The screw should now be entirely in the grouping box. If not, select *Ungrouping Tool* (just to the right of the *Grouping Tool*) and click the mouse SELECT button on the border of the grouping box to ungroup. Repeat this step until you have enclosed the screw.

4. Click the mouse SELECT button on the *Copy Tool* (first row under *Drawing Tools* on the *Format Editor Control* panel, next to the *Eraser Tool*).



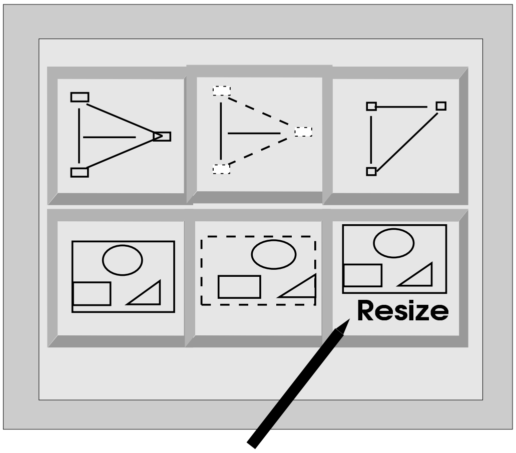
Copy Tool

5. Click the mouse SELECT button on the border of the grouping box in the *Drawing Area.* Notice that the mouse pointer changes shape and an outline box appears attached to it.

6. Move the outline box to the upper right corner of the facing plate and click the mouse SELECT button again. A second copy of the screw appears where you click.

7. Repeat steps 5 and 6 to make more copies of the screw for the lower left and lower right corners of the facing plate.

8. If the border needs to be adjusted, click the mouse SELECT button on the *Resize Tool* (second row under *Drawing Tools* on *Format Editor Control* panel).

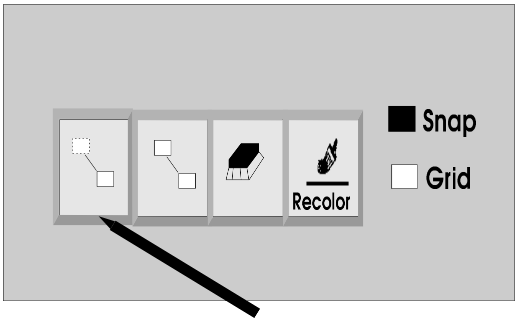


Resize Tool

9. To adjust the border, select the border by clicking on it. Then click on a corner of the box and move the mouse cursor to a suitable location and click again.

10. To realign any of the objects:

— Click the mouse SELECT button on the *Move Tool* (first row under *Drawing Tools* on the *Format Editor Control* panel).



Move Tool

— In the *Drawing Area*, click the mouse SELECT button on the objects.

— Move the outline box to the new location and click the mouse SELECT button again.

Use step 10 to set the screws into the corners of the border and to move the text lines and DFDs into their appropriate positions, as shown in the sample format.

11. To make sure everything has been realigned correctly, select *Redisplay* from the *View* menu, or click the mouse OPTION button while the cursor is in the *Drawing Area* and select *Redisplay* from the pop-up option list.

12. To save the `testformat` format and quit the Format Editor:

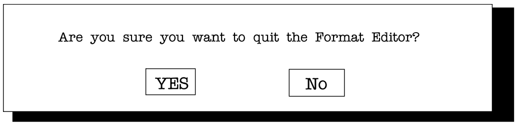
    From the *File* menu on the *Format Editor Control* panel:

    — Select *Save*

    — Select *Dismiss*

    — Select *Exit*

13. The following dialog box appears:



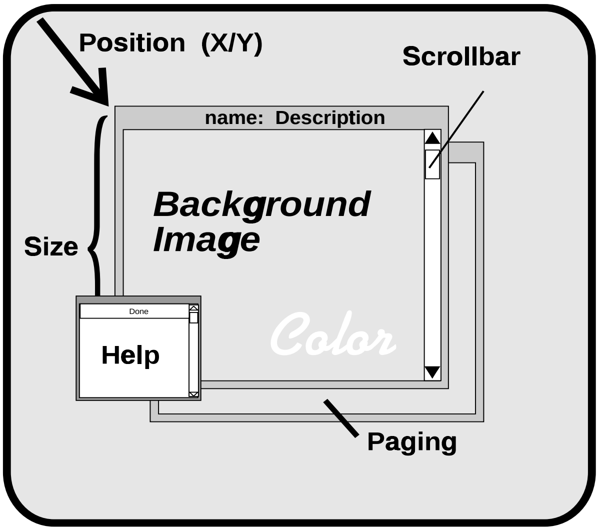
Are you sure you want to quit the Format Editor?

14. Click the mouse SELECT button on the *Yes* button.

Format description is the first major step in defining a format for a *Sammi* window. Before you begin drawing static or dynamic objects, you should first decide:

- The layout of the final *Sammi* window
  - — Initial size and position for the window.
  - — Background color.
  - — Background images (photos, schematics, etc.). Should the window have "layers" (similar to transparencies placed on top of each other)?
- The operation of the final *Sammi* window
  - — Automatic paging to other windows.
  - — Help information.
  - — Scrollbars.

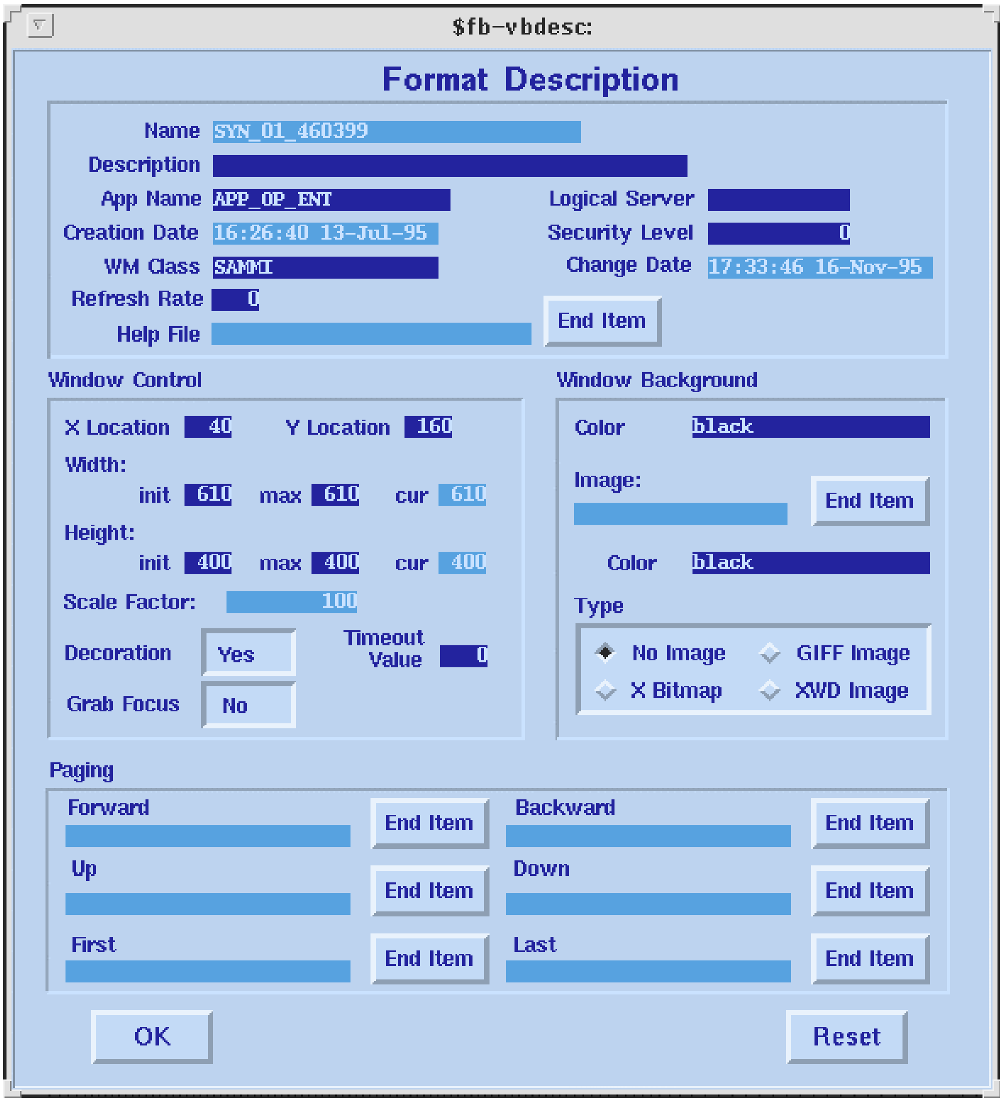
Many of these decisions were discussed earlier in ***Chapter 2*** of this guide. Notice that we are not yet making *all* the decisions about the format. At this point, we are simply describing the basic “look and feel” of the final *Sammi* window.



In later chapters, we will discuss adding dynamic fields and data access to the basic format.

Entering a format description

You can describe or modify the size, position, color, and other attributes of a *Sammi* window by using the *Format Description* panel shown below. After opening a format either with the *New* or *Open* option from the *File* menu, display the *Format Description* panel with the *Attributes* option of the *File* menu. Now change any of the preset values by clicking on the field and typing in the appropriate text and/or values..



$fb-vbdesc:

Format Description

Name: SYN_01_460399
Description:
App Name: APP_OP_ENT
Logical Server:
Creation Date: 16:26:40 13-Jul-95
Security Level: 0
WM Class: SAMMI
Change Date: 17:33:46 16-Nov-95
Refresh Rate: 0
Help File:

Window Control
X Location: 40
Y Location: 160
Width: init 610 max 610 cur 610
Height: init 400 max 400 cur 400
Scale Factor: 100
Decoration: Yes
Timeout Value: 0
Grab Focus: No

Window Background
Color: black
Image:
Color: black
Type: ● No Image ◇ GIFF Image ◇ X Bitmap ◇ XWD Image

Paging
Forward:
Backward:
Up:
Down:
First:
Last:

Press the RETURN key or click the mouse SELECT button on the *OK* button when you are finished. (If you press the RETURN key, the *Format Description* panel remains on the screen.) Visual effects such as color or background image will not appear in `$fb-bkgd` until you click on the OK button.

More specific information on some of the entries is provided in the following sections of this chapter. All entries except *X Location*, *Y Location*, *Width: initial* and *maximum*, and *Height: initial* and *maximum* are optional. For valid entries, see the following table. To return the entries to their previous values, press the Reset button.

NOTE: After "OK" is pressed, the previous values are lost.

Entry Option	Meaning
Name	Display-only field. This is the file-system format name. The name has the following layout: **S_**<*SID*>**_<*End Item Name*>**
Description	Enter the title of the format that will appear in the title bar of the final *Sammi* window, along with the format name. For example, if the format name is `S_123_format1` and the description is `Pressure Control Screen,` the following will appear in the title bar of the *Sammi* window when it is displayed in the Runtime Environment: `S_123_format1: Pressure Control Screen`
Help File	This field is read-only. Use the *End Item* button to change the attached FWDU_HELP_TEXT type End Item.
App Name	For formats with data entry fields; determines whether or not the *Sammi* user will be able to use the RETURN key for entering data. If the RETURN key is disabled, some other method must be provided for user entry. Valid options are: 1 RETURN key enabled for data entry 2 RETURN key disabled for data entry
Security Level	Enter the security level code for this format, as explained later in this chapter.
Logical Server	The name of the Logical Server for the display. This should bee FWDU_SERVER.
Creation Date/Change Date	Display-only fields. These show the respective dates for the creation and current change date.

Entry Option	Meaning
WM Class	Set the window manager class property for the format. This class can be used in user's .`Xdefaults` file to set resources. For example, if the class is `SAMMI2` and if the user sets this line in the `.Xdefaults` file:

```
Mwm*SAMMI2.clientDecoration:none
```

Then formats that are set to class `SAMMI2` will have no decorations. Listed below are the classes you can define in the Format Editor:

Class Name	**vb_class**
SAMMI	0 (DEFAULT CLASS)
SAMMI1	1 (AUTORAISE)
SAMMI2	2
SAMMI3	3
SAMMI4	4
SAMMI5	5
SAMMI6	6
SAMMI7	7
SAMMI8	8
SAMMI9	9
SAMMI10	10

NOTE: The autoraise feature means that the format always remains on top of other formats. For more information on the window manager classes, see ***Chapter 3 System Administrator's Guide***.

Format Description Entries (continued)

Entry Option	Meaning
Window Control:	
X and Y Locations	Enter the initial horizontal (X)/vertical (Y) coordinates (in pixels) for the upper left corner of the *Sammi* window, as explained later in this chapter.
Width/Height (init/max/cur)	Enter the initial and maximum dimensions (in pixels) of the *Sammi* window, as explained later in this chapter . The default setting of *Width* and *Height* are 610 and 400 (in pixels). The `cur` field is an unenterable field and its values correspond to the existing size of `$fb-bkgd`. The values may not exceed the values found in the Equipment Constraint End Item.
Scale Factor	Display-only field. Shows the zoom factor of the `$fb-bkgd` as a percentage; for example, 200 (%) is twice the normal size, 100 (%) is normal size, 50(%) is half the normal size.
Decoration	Select whether a format has decorations when it displays in *Sammi* by clicking the mouse SELECT button in this box to toggle between *Yes* and *No*.
Timeout Value	If this format is to be used as a temporary pop-up or dialog panel, enter a numeric value for the number of seconds that it remains visible. This becomes the default which can be overridden at runtime with the `-t` option of the **add-window c**ommand.
Grab Focus	If this format is to be used as a temporary pop-up or dialog panel, select whether it "grabs" the focus when it appears by clicking the mouse SELECT button in this box to toggle between Yes and No.

NOTE: If you select *Yes* for the *Grab Focus* field, you should always include a *Cancel* or *Dismiss* button that issues a **delete-window** command, or set the timeout value; otherwise the user cannot remove the format from the screen and can only regain control of the cursor by killing *Sammi*.

Format Description Entries (continued)

Entry Option	Meaning
Window Background:	
Color	Enter the background color of the window, as explained later in this chapter.
Image	You can change the background image by using the End Item button next to the field. The field itself is read-only.
Image Color	Enter color for the background image, as explained later in this chapter.
Image Type	Read-Only. The type is determined by the attached image's type. (See above)
Page Fwd/Bkwd/etc.	Formats to be linked for paging purposes, as explained later in this chapter. Use the End Item buttons to change these fields. The End Items must be of type FWDU_SYNOPTIC_DISPLAY.

Defining window size and position

If you have planned correctly, you should already know the desired size and position of each *Sammi* window being designed.

- The size of the final *Sammi* window corresponds exactly to the size of the `$fb-bkgd` and is controlled by the *Width* and *Height* entries in the *Format Description* panel for the format.

- The location of the window (when it appears in *Sammi*) is controlled by the *X Location* and *Y Location* entries in the *Format Description* panel.

Also, each of the visual elements that you later add to this format will appear in the final *Sammi* window in the exact size that you draw them and at the exact location that you place them inside `$fb-bkgd`.

Window position (X/Y location)

Windows first appear in the Runtime Environment at the location defined in the *X Location* and *Y Location* fields in the *Format Description* panel. You can change the location to any value desired:

- **X Location** is the desired horizontal distance (in pixels) from the left side of the screen to the left edge of the *Sammi* window.
- **Y Location** is the desired vertical distance (in pixels) from the top of the screen to the top edge of the *Sammi* window.

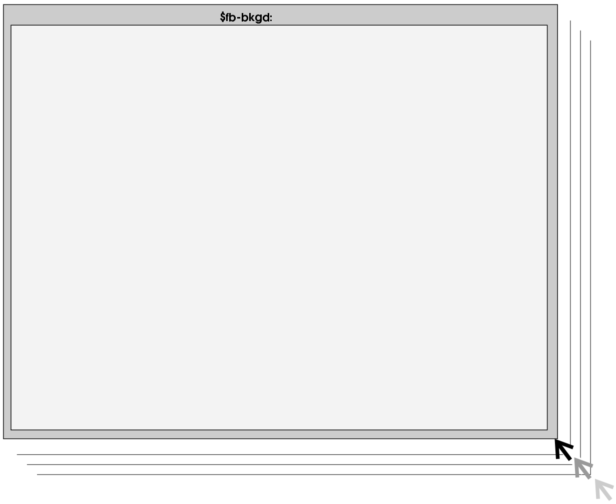
Keep in mind that these are initial values. Because *Sammi* operates under the X Window System, the *Sammi* operator can move windows to any position desired. Also, be careful not to position a format so far to the right or so far down that it will run off the edge of the screen. For an explanation of pixel measurements, see ***Appendix E***.

Window size (width/height)

On some workstations, you can change the size of `$fb-bkgd`— and thus the size of the final *Sammi* window— by dragging corners of the frame, as explained below:

NOTE: Some window managers do not support this method. If the following steps do not work, see your window manager documentation for instructions on resizing windows.

1. Move the cursor to the lower right corner of the `$fb-bkgd` format.
2. Hold down the mouse SELECT button and use the mouse to drag the corner in any direction. As you do so, the corner moves with the cursor.



3. When the `$fb-bkgd` format is the desired size, release the SELECT button.

NOTE: When you use the previous procedure to resize the `$fb-bkgd` format, you must change the maximum width and height fields on the *Format Description* panel to add objects to the area outside of the original maximum size (indicated by a white box).

After you resize using the method on the previous page, the values in the `cur` fields under the *Width* and *Height* should be used in the respective maximum fields to adjust the drawing area with the size of the window.

You can also resize the `$fb-bkgd` format by typing new dimensions next to *Width* and *Height* in the *Format Description* panel. The width and height must be entered in pixels, as explained in ***Appendix E***.

The `$fb-bkgd` format resizes automatically according to the size of the *Width* and *Height*, when you click on *OK* at the bottom of the *Format Description* panel, or when you press the RETURN key on the keyboard. (If you press the RETURN key, the *Format Description* panel remains on the screen.)

You can enter an *initial size* and a *maximum size* for both *Width* and *Height.* If you enter only an initial or only a maximum size, the `$fb-bkgd` resizes to the size entered. If you enter both, the `$fb-bkgd` resizes to the maximum size. If you enter a *maximum size* less than an *initial size*, then the *initial size* will become equal to the *maximum size*.

These two entries control the operation of the window when it appears in the Runtime Environment. Since the *Sammi* user will be able to resize any window, the initial size you specify using the Format Editor is the size of the window when it first appears in the Runtime Environment.

The *maximum size* is used to provide an upper limit for user resizing. The window cannot display anything larger, even if it is resized larger by the *Sammi* user. In the Format Editor, the format to be modified initially appears at the *maximum size*, but in *Sammi* Runtime, the format will be displayed using the minimum width and height (assuming they are smaller than the maximum), and scrollbars will appear..

Restricting access (security)

You can restrict access to individual *Sammi* windows and to specific dynamic fields within the windows. Access to a *Sammi* window is governed by the *Security Level* entered on the *Format Description* panel. Access to individual dynamic fields is governed by the *Security Level* entered on the *DFD Display* panel.

Security levels are defined by the system administrator using procedures described in the ***System Administrator's Guide***. If you do not know the correct security level codes, ask your system administrator. A value of 0 establishes unrestricted access; that is, any user can add, delete, copy, or change the format.

Linking formats through paging

One of the more useful features of the Format Editor is that it lets you construct multiple linked formats that can be paged in the Runtime Environment like the pages in a book. The *Sammi* user can page forward, backward, up, down, first, or last to other windows via the six commands: **page-forward, page-up, page-back, page-down, page-first,** and **page-last**.

NOTE: If you leave these fields blank, no paging can occur. Also, every format used for paging must have at least one dynamic field on it in order to page properly.

The *Paging* entries in the *Format Description* panel are used to link the current format to other formats for paging purposes. To enable paging, you must type in the name of the other formats that will be accessed from the current format for each of the paging functions listed.

For example, if you want two formats named *format1* and *format2* to be linked using the **page-forward**/**page-back** commands, type *format2* as the *Page Fwd* entry for *format1* and *format1* as the *Page Bkwd* entry for *format2*. Thus, if the *Sammi* user enters the **page-forward** command while viewing *format1*, *format2* automatically replaces *format1*. The opposite occurs if the *Sammi* user enters the **page-backward** command.

When linking formats in this way, you should have a clear idea of logical progression between formats. The **page-forward** command should take the *Sammi* user through a certain sequence of windows; the **page-backward** command should take the user back through the same windows in reverse sequence.

Likewise,the **page-up** command and the **page-down** command should move through different levels of the window hierarchy in the reverse sequences. The **page-first** command and the **page-last** command should move to the first page and last page of the current window hierarchy respectively. None of these paging commands has an intrinsic logic of their own: you are left to establish the linkages in a logical manner.

By linking two formats using the **page-forward** or **page-up** fields, you do not automatically apply a reverse linkage in the opposite direction (**page-backward** or **page-down**). You need to make entries in the respective *Format Description* panels in order to establish two-way linkage.

The Runtime Environment just brings up formats using whatever names are listed in the paging fields of the *Format Description* panel to decide where to go when a paging command is entered. If any paging linkage is left blank, that particular paging command is not enabled when the current format is displayed.

When you design your format, an obvious way to use the paging commands is to define *General Action Buttons* that use the **page-forward**, **page-backward**, **page-up**, **page-down, page-first**, and **page-last** commands and label them with meaningful labels. (See the ***General Action Button*** display type section in ***Chapter 7***.

Creating on-line help

You can provide the *Sammi* user with on-line help by attaching a FWDU_HELP_TEXT to a format. To request help, the *Sammi* user holds down the SHIFT key and clicks the mouse OPTION button in the appropriate area of the screen to pop up a window containing the help information, if it exists. To create on-line help, follow these steps:

1. Create a FWDU_HELP_TEXT End Item in the MDB via the I_MDB.
2. Invoke the created End Item where after a text editor appears.
3. Enter the help text and save your work by pressing the *Save* button.
4. Attach the created End Item as the *Help End Item* entry in the *Format Description* panel if you want it to pop up from the window background, or the *DFD Display* panel if you want it to pop up from a dynamic field.

The Format Editor allows you to create one general help file per format and an additional help file for each dynamic field.

Adjusting the window background color

When you create a new format, `$fb-bkgd` appears with a colored background (usually black). You can change this background to another color by entering a color in the *Window Background Color* field of the *Format Description* panel.

To choose a color, either click the mouse OPTION button in the box to display a list of color choices or enter a color name **exactly** as it is shown in ***Appendix A Standard Colors***. The selected background color does not appear in `$fb-bkgd` until you press the RETURN key or click on the *OK* button at the bottom of the *Format Description* panel.

Using background images

You can import scanned images into the `$fb-bkgd` format to serve as the window background. Typical background images can include any of the following:

Maps	Blueprints
Schematics	Control panel layouts
Organization or product logos	Photographs

Any of these images can be scanned in using commercial scanning hardware and software. Depending on the type of scanning equipment used, these may be imported as color or monochrome images.

The scanning process converts lines or shaded areas in the scanned image into individual tiny dots that are reproducible on a monitor screen. The dot patterns (*bitmaps* and *pixmaps*) are then stored in a file that can be copied to your network and loaded into the Format Editor.

Accepted image formats

The Format Editor accepts three types of graphics files for use as background images:

- **`.gif.`** or FWDU_GIF_BINARY End Item in the MDB. This is a standard Graphic Interchange Format used for color images (including color photographs); also called a *pixmap*.

- **`.xbm.`** or FWDU_X_BINARY End Item in the MDB. This is the X11 Bitmap format used for monochrome images; also called a *bitmap* (or *X bitmap*).

- **`.xwd.`** or FWDU_XWD_BINARY End Item in the MDB. This is the output from the `xwd` utility; also called an X window dump file.

If your commercial scanner does not produce any of these formats, various commercial utility programs are available that can convert other types of graphics files (such as `.tif` or `.pcx`) to the `.xbm` or `.gif` format.

Scaling an image

As it imports a background image, the Format Editor does not rescale the image to fit the `$fb-bkgd` format, but uses it in the same size as the original scan. Some commercial scanners provide scaling and sizing as part of the scanning process so that you can reduce or enlarge an image to any size or resolution desired. Keep in mind, however, that size may vary if the scanning resolution does not match the resolution of the work station monitor (see ***Appendix E*** for a discussion of monitor resolution).

Re-touching images

You can also use commercial paint software to retouch scanned images before importing them into the Format Editor. Retouching is used to clean up unwanted features and blemishes or add desired features such as thicker lines.

If you do not have the proper equipment to do this, consider using a service bureau that specializes in computer graphics, typography, or desktop publishing. Many service bureaus have not only the proper equipment in-house but also the expertise to retouch scanned images.

Creating your own bitmapped images

You can produce very small graphic symbols or icons using an X bitmap editor. Most workstations running the X Window System provide a bitmap editor utility that appears when you enter the bitmap command (consult your X Window System manual for the command syntax).

Most such bitmap editors provide rudimentary drawing or “painting” tools that can be used to create simple shapes and designs. For complex images, however, you should use a professional paint program, then convert the resulting file to `.xbm` format using a graphics file conversion utility.

Importing the background image

Enter the following in the *Format Description* panel:

1. Select your the image using the End Item button next to the Image field and under the Window Background text.

2. The type is automatically set so it matches your selection.

3. If you are importing an `.xbm` file, enter the desired foreground color for the image in the box beside the *Color* label under the *Window Background Image* titles. To choose a color, either click the mouse OPTION button in the box to the right of *Color* and then click the mouse SELECT button on a color from the resulting pop-up option list, or enter a color name **exactly** as it is shown in ***Appendix A Standard Colors***. If the imported file is in `gif` or `xwd` format, the Format Editor ignores the color designation and uses the `xwd` or `gif` colors. A special X Window System function converts `xwd` or `gif` colors to the closest color available on the X server to avoid loss of hues.

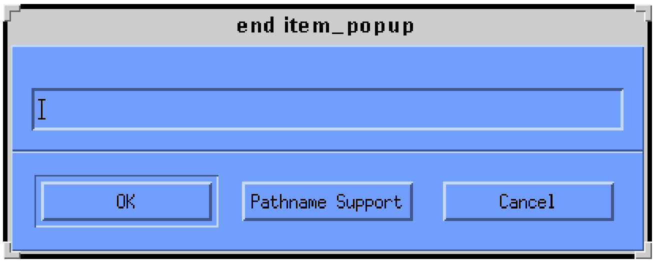
4. Press the RETURN key.

The image appears automatically in the background of the `$fb-bkgd` format.

Importing a movable static image

To import a static graphic object that can be moved and/or resized on the format:

1. Select *Import Image* from the *File* menu in the *Format Editor Control* panel to retrieve a graphic. The window below appears:.



2. Complete the Pathname to an image End Item (See Section: Accepted image formats). Pathname Support will filter the End Items. The Pathname is by default prefixed with the path to the invoked synoptic display.

3. Press OK.

4. Position the graphic on your format by moving the outline to the position that you want using the mouse and clicking the mouse SELECT button.

Specifying an application type

Notice that all your entries so far in the *Format Description* panel have been accomplished by pressing the RETURN key or clicking on the *OK* button at the bottom of the panel.

- The **RETURN key** causes everything you typed into the *Format Description* panel to be accepted and applied to the format you are creating. If you have made multiple entries, they are all accepted and applied simultaneously.

- The ***OK* button** causes everything you typed into the *Format Description* panel to be accepted and applied to the format you are creating, then removes the *Format Description* panel.

You can provide this type of functionality to any new formats you are creating by filling in the *Application Type* entry on the *Format Description* panel for each new format being created. The two application types are explained below:

- **APP_OP_ENT.** This method *enables* the RETURN key, so that the *Sammi* user can enter data by typing it in and then pressing the RETURN key. This is the standard method of entering data in most computer programs, including the Format Editor. You can also create push buttons, menu options, or function keys that perform the same function. For example, the *Enter* button at the bottom of the *Real Display* panel performs the same function as the RETURN key.

  For **APP_OP_ENT**, you can include a *Cancel* (or *Reset*) function tied to a push button, menu option, or function key that allows the user to clear entries before they are accepted.

- **APP_CNF_OP_ENT.** This method *disables* the RETURN key, so the *Sammi* user cannot use it for entering data. If you use this method, you must provide the user with a push button, menu option, or function key that performs the *Confirm* function. For example, if the user types in data and clicks on the *Confirm* button, the entries are accepted by *Sammi*. Having a *Confirm* button forces the user to con- sciously
  confirm data entries, instead of automatically pressing the RETURN key.

  For **APP_CNF_OP_ENT**, you can set up one of four commands to be initiated from the format with a function key, a push button, or a menu. These commands are:

confirm	**Writes all fields in the format that have been updated by the user.**
confirm&delete	Writes all fields in the format that have been updated by the user and deletes the format from the screen.
cancel	Clears all fields and redisplays data in the fields prior to the user entries.
cancel&delete	Clears all fields and redisplays data in the fields prior to the user entries and deletes the format from the screen.

NOTE: To create a function key, a push button, or menu option that sends one of the commands described above, send the command to the logical server `$app-cmd`.

Chapter 7 explains how to create push buttons and menu options that perform these commands. See the ***System Administrator's Guide*** for information on defining function keys, or ask your system administrator for help.

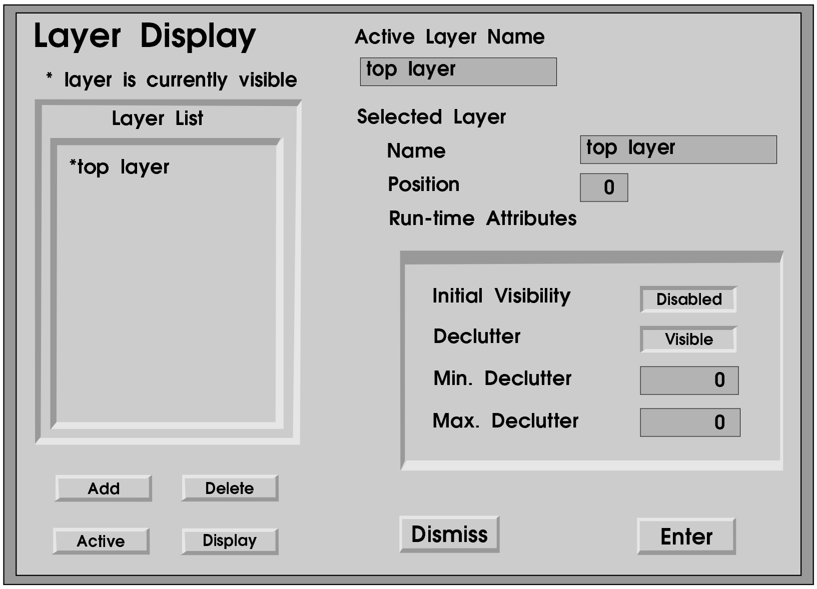
Entering a layer description

You can create a *Sammi* format with layers. As an example, imagine a presentation consisting of several coordinated overlays that start with a simple diagram; as you add overlays, the diagram becomes more detailed.

Layers on a *Sammi* format work similarly, except that instead of physically adding or removing overlays, the Runtime Environment allows the user to turn layers on or off. Each layer might contain one or more DFDs and/or static graphic objects.

NOTE: You do not always need layers. If your format is uncluttered without layering, do not select this option; your format defaults to one layer, and all objects that you draw or add will be on that layer.

You can define or modify the position, (in)visibility, decluttering and other attributes of the layers through the *Layer Display* panel shown on the next page. To define the layers, open an existing format (or create a new format), then select the *Layers* option from the *Edit* menu on the *Format Editor Control* panel. Enter the information as required on the *Layer Display* panel.



Layer Display

* layer is currently visible

Active Layer Name: top layer

Layer List
*top layer

Selected Layer
Name: top layer
Position: 0
Run-time Attributes
Initial Visibility: Disabled
Declutter: Visible
Min. Declutter: 0
Max. Declutter: 0

Once you have added the layer, in order to draw any static objects or dynamic objects, you must make the layer active. To do this, click the mouse SELECT button on its name in the *Layer List* of the *Layer Display* panel; then click the mouse SELECT button on the *Active* button. Now draw any objects or add any DFDs to this layer that you desire.

To change the active layer, click the mouse SELECT button on another layer name in the *Layer List* of the *Layer Display* panel; then click the mouse SELECT button on the *Active* button. Make any modifications or additions to that layer.

When a layer is active in the Format Editor, it is automatically displayed, and you can hide it by clicking the mouse SELECT button on the *displayed* button, which then changes to a pushed- in, *hidden* button. Click on the *hidden* button to redisplay the layer.

To create a new layer at the bottom of the *Layer List*, click the mouse SELECT button on the *Add* button, then enter the information for the layer in the appropriate boxes. Once you have entered all the information for a layer, either press the RETURN key or click the mouse SELECT button on the *Enter* button.

To add a layer into an existing list:

1. Click the mouse SELECT button on the *Add* button.

2. Type in the information for the new layer, changing the *Position* field to the number at which you want the new layer to be located.

3. Either press the RETURN key or click the mouse SELECT button on the *Enter* button.

The *Position* field for all layers that follow the one you add are automatically updated, and the *Layer List* is sorted in position order.

To delete a layer, click the mouse SELECT button on the name in the *Layers List.* Then click the mouse SELECT button on the *Delete* button.

When you have added and saved all the layers you want, close this panel by clicking the mouse SELECT button on the *Dismiss* button.

Layer Display Entries

Entry Option	**Meaning**
Active Layer Name	Display-only. This field is determined when you click on the *Active* button.
Selected Layer	
Name	Enter the text for the layer name. The default value for this field is `LAYER #`, where # corresponds to the number of the field.
Position	When a new layer is added, this field is the next sequential number for the layer.
Runtime Attributes	
Initial Visibility	Click the mouse SELECT button in the box beside this label to toggle between: **Visible.** Layer initially appears when format is displayed in the Runtime Environment. **Invisible.** Layer does not appear when format is displayed in the Runtime Environment.

Layer Display Entries (continued)

Entry Option	**Meaning**
Declutter	Click the mouse SELECT button in the box beside this label to toggle between Disabled and Enabled. When this field is Disabled, Min. Declutter and Max. Declutter (below) have no meaning.
Min. Declutter	Specify the minimum zoom factor for this layer. Initially this value is set to 0 (zero), which means "no declutter."
Max. Declutter	Specify the maximum zoom factor for this layer. Initially this value is set to 0 (zero), which means "no declutter."

NOTE: If *Declutter* is set to *Enabled*, the layer will be "viewable" in the zoom range between the values in the *Min. Declutter* and the *Max. Declutter* fields.

Introduction

Chapter 3 described how you use some of the Format Editor's *Drawing Tools*; this chapter offers an in-depth discussion of those tools.

Use the Drawing Tools to create visual elements on a format such as lines, boxes, text, etc. Typically, these visible elements are not part of the background image or not part of a dynamic field display (DFD) type, and are called *static objects.* You can use static objects to create:

- Borders, dividers, and boxes that delimit different areas of the format
- Titles and labels (those not provided by DFDs)
- Organizational diagrams
- Flow charts and flow symbols
- Process flow indicators
- Any other visual element not provided by the background image or dynamic fields (DFDs)

Once drawn, you can then manipulate static objects— move, copy, stack, flip, rotate, bend, or fill them with colors and patterns.

Once integrated into *Sammi*, they become part of the *static background* on which dynamic components are overlaid. Groups of static objects can also be converted to *dynamic objects* using the *Dynamic Object* display type discussed in ***Chapter 7 Display Types***. This allows you to draw visual elements not provided through *Sammi's* dynamic object library and use them to represent data. For example, you can create a tank that shows a fill level.

Static objects are an integral part of the format and are stored in the format along with dynamic fields. You can save formats with static objects and text or formats only with dynamic fields to use as *templates* for future formats. This function saves time because you can borrow visual elements from past drawings instead of redrawing them each time you create a new format.

Later in this chapter, you will learn how to store frequently used groups of DFDs and static objects, so they can be easily retrieved and inserted into any format that you are creating.

Drawing tools available

With the *Drawing Tools* buttons on the *Format Editor Control* panel, you can:

- Draw objects such as:

  —Rectangles or squares

  —Lines with single or multiple segments

  —Polygons (open and closed)

  —Circles (by radius or by diameter)

  —Ellipses (by radius or by diameter)

  —Splines (open and closed)

  —Arcs or wedges

  —Text (words, numbers, symbols).

- Manipulate objects (or groups) by:

  —Defining the grid and snap values for easy alignment

  —Setting their line orientation control (diagonal, horizontal/vertical)

  —Adjusting their shapes or sizes

  —Changing their attributes

  —Grouping/ungrouping them

  —Moving/copying them

  —Scaling them

  —Deleting them

  —Flipping them (horizontal, vertical)

  —Rotating them (clockwise, counterclockwise)

  —Changing splines to polylines or polylines to splines.

With the **pulldown** and **pop-up menus** on the *Format Editor Control* panel, you can:

- Set the following attributes:
  - — Text font
  - — Resetting their drawing order (front to back)
  - — Line thickness
  - — Line fill style (solid, dash)
  - — Line cap and joint style
  - — Line dash pattern
  - — Line arrowheads
  - — Object fill type (none, solid, stipple)
  - — Object fill rule (even/odd, winding)
  - — Stipple pattern
  - — Color (foreground, background, window).
- Select other convenient functions, such as:
  - — The *DFD* palette
  - — Import other formats into the current format, including all static objects and dynamic fields.

With the **mouse** OPTION **button** in the *Drawing Area* (`$fb-bkgd`), you can:

- Undo the last operation
- Redraw all objects
- Zoom and pan on objects, as well as return to a full view of format
- Reset format to initial or maximum size
- Remove all objects.

With the **command line** of the *Format Editor Control* panel, you can:

- Scale and/or move all the static and dynamic objects (except bitmaps and bitmap text) in a format.
- Pan (move) the cursor around the *Drawing Area* (`$fb-bkgd`) and zoom (magnify) into detailed graphics for more accurate (precise) drawings.
- Add the *Color Palette* panel.

Before you begin drawing

Before you start drawing static objects, you can save time by using some of the functions discussed on the following pages.

Importing a format

You can import all the static objects and dynamic fields of a format into another format using the **import** function.

To import a format, follow these steps:

1. Either select *Import Fmt* from the *File* menu whereafter a Format_popup appears.
2. Complete the Pathname to a FWDU_SYNOPTIC_DISPLAY. You can use Pathname Support as a help.
3. Click on *OK*.
4. Move the cursor into the *Drawing Area* (`$fb-bkgd`), where it turns into an outline box the size of the format being imported.
5. Move the outline box to the desired location and click the mouse SELECT button. The imported components appear grouped in the *Drawing Area* (`$fb-bkgd`) at the location of the outline box.

NOTE: Imported dynamic fields may not work as expected. See ***Chapter 7 Display Types*** for an explanation of each dynamic field's behavior.

Aligning objects to a grid

Drawing objects is easier if you use the Grid function. The Format Editor allows you to set up a visible grid pattern and then "snap" objects to the grid for easier alignment. With the Snap function turned on (see below), any lines you draw are confined to grid points, and the sides of any shapes you draw line up with the same points. Therefore, with both the Grid and Snap functions on, every object you draw is automatically aligned to other objects on the same grid.

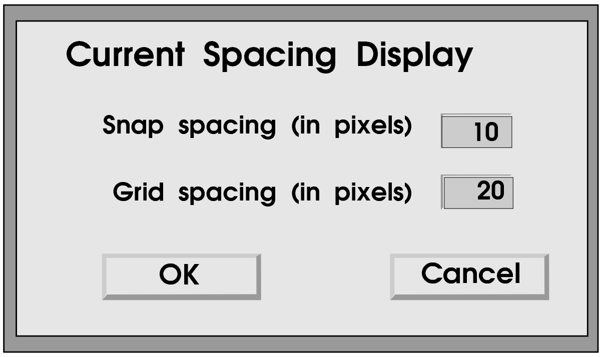
Setting the Snap and Grid function spacing

You can display a grid of varying size (by pixels), or you can turn the *Grid* function off. When you have the *Grid* function off and the *Snap* function on, your objects still align to the “invisible grid.”

NOTE: To line up objects exactly or create a "library" of parts with interconnecting segments, all drawing should be done with Snap on, with a Snap spacing of n pixels (where n= 1, 2, 5, 10. . .); this forces all points (endpoints, circle centers, vertices) to be on a Sammi pixel boundary. Then, lines will always connect properly, even if you zoom.

To set up and control the S*nap* and *Grid* functions:

1. Select the *Snap/Grid* option from the *Styles* menu on the *Format Editor Control* panel. The *Current Spacing* panel appears:



Current Spacing Display

Snap spacing (in pixels) 10

Grid spacing (in pixels) 20

Current Spacing Panel

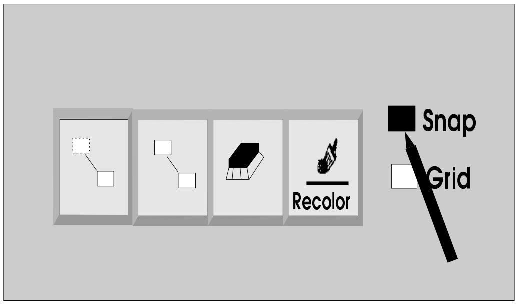
2. In the *Current Spacing* panel, enter the desired values for *Grid* and *Snap* spacing (in pixels).

NOTE: You can set the *Grid* and *Snap* spacing independently of each other, but the *Grid Value* must always be an even multiple of the *Snap Value*.

3. Click on the *OK* button with the mouse SELECT button to close the *Current Spacing* panel. (To close the pop-up panel without making changes, click the mouse SELECT button on the *Cancel* button.)

Turning the Snap and Grid functions on and off

Once you have set the *Snap* and *Grid* spacing, you can turn the *Snap* and *Grid* functions on and off by pointing to and clicking the mouse SELECT button on *Snap* and *Grid* buttons (on the far right of *Format Editor Control* panel) to toggle between *Grid On* and *Grid Off* and *Snap On* and *Snap Off*, as indicated by the "indicator" lights.

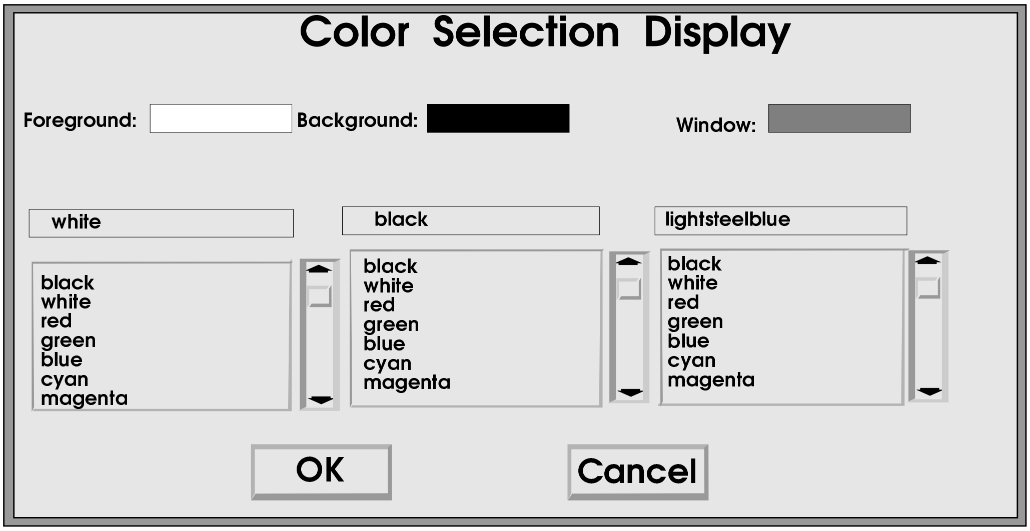


Selecting colors using the Color Selection Display panel

Any new objects you draw in the *Drawing Area* appear in the default colors shown in the *Color Selection Display* panel. You can always change an object's color later (see the ***Recoloring objects*** section later in this chapter). To save time, you may prefer to set default colors before drawing begins.

To display the *Color Selection Display* panel:

1. Choose the *Select...* option from the *pull-right* menu that appears when you select *Colors* from the *Style* menu on the *Format Editor Control* panel to display the *Color Selection Display* panel.



Color Selection Display

Foreground: ⬜ Background: ⬛ Window: ▨

white

black

lightsteelblue

Color Selection Display Panel

2. Under each title box (Foreground, Background, Window), click on the name of the color you want to use for that area. The patch of color beside each of the three titles changes to the color you select. These areas are:

   — **Foreground color**. Used by all objects as the primary color.

   — **Background color**. Affects opaque dashed lines and stipple fills.

   — **Window color**. Specifies the color of the *Drawing Area* (`$fb-bkgd`) on the *Format Description* panel.

Selecting colors using the Color Palette

Instead of using the *Color Selection Display* panel, you may find it quicker to select colors from the *Color Palette* panel. To add this panel, choose the *Colors* option from the *pull-right* menu that appears when you select *Colors* from the *Style* menu on the *Format Editor Control* panel to display the *Color Palette* panel.

To select colors from this panel:

1. Click the mouse SELECT button on the push button (at the bottom of the *Color Palette* panel) for the area for which you are setting the color (Foreground, Background, Window).

2. Click with the mouse SELECT button, the square of color to which you want to change the selected area.

With the palette displayed on the screen, you can easily change color for any new object by selecting the foreground color before drawing the object. The palette also works well to recolor objects (see ***Recoloring objects*** later in this chapter).

NOTE: After you call up the *Color Palette* panel for the first time, it remains on the screen throughout your drawing session unless you remove it by typing the following command in the Format Editor command line:

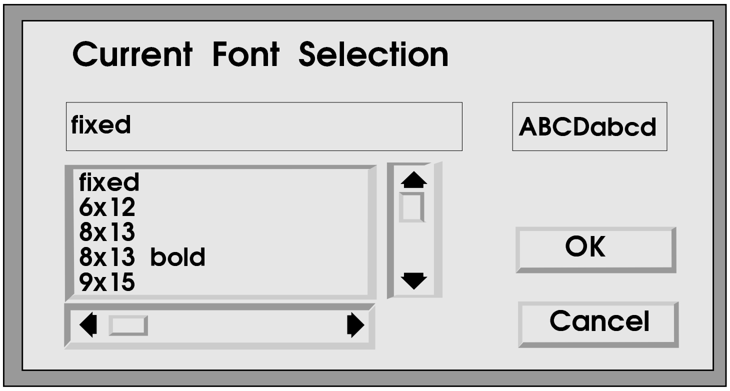
```
d-w $fb-palette
```

You can also remove this panel using the **close** (OSF/Motif) command, the **quit** (OpenLook) command, or your window manager’s equivalent command.

Selecting font styles

Any new text you create uses the default font shown in the *Current Font Selection* panel. You can always change fonts later (see ***Recoloring objects*** later in this chapter). To save time, however, you may prefer to set the font before creating text objects. Follow these steps:

1. Select the *Fonts* option from the *Style* menu on the *Format Editor Control* panel. The *Current Font Selection Display* panel appears.



Current Font Selection Display Panel

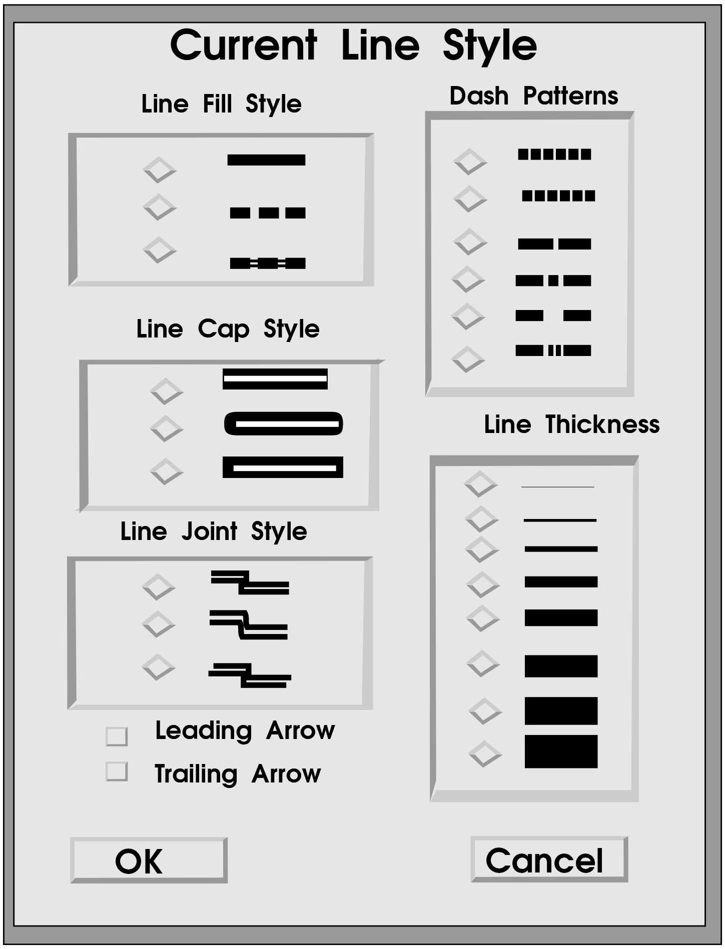
2. Click the mouse SELECT button on the name of the font you want to use for your format. See ***Appendix B*** for information on the available fonts.

3. Click the mouse SELECT button on the *OK* button to close the pop-up panel. (To close the pop-up panel without making changes, click the mouse SELECT button on the *Cancel* button.)

Selecting line styles

Any object you draw is made up of lines that form the edges of circles, arcs, rectangles, and polygons. You can draw straight or bending lines that go from one point to another. Whenever a line appears as part of an object, it uses the default characteristics shown in the *Current Line Style* panel. You can always change line styles later (see ***Recoloring objects*** later in this chapter). To save time, however, you may prefer to set line styles before drawing begins.

To display the *Current Line Style* panel, select the *Line Style* option from the *Style* menu on the *Format Editor Control* panel. The *Current Line Style* panel appears.



Current Line Style panel

The different styles are:

- Line fill (solid, dashed, double-dashed)
- Line cap (butt, rounded, projecting)
- Line joint (mitered, rounded, beveled)
- Dash pattern
- Line thickness
- Arrowheads

A detailed explanation of these controls follows.

Setting the current line style defaults

To set the defaults for each of the controls on the *Current Line Style* panel:

1. Click on one of the radio buttons under each of these controls with the mouse SELECT button. The indicator appears next to your selection.
2. Click on the *OK* button with the mouse SELECT button to close the pop-up panel. (To close the pop-up panel without making changes, click the mouse SELECT button on the *Cancel* button.)

Line fill (Solid, Dashed, Double-Dashed)

With the line-fill control, you can set lines to look solid or dashed. You can also specify whether dashed lines are transparent or opaque.

A dashed line is transparent. Only the foreground color is used. Underlying objects can be seen between the empty spaces between the dashes.

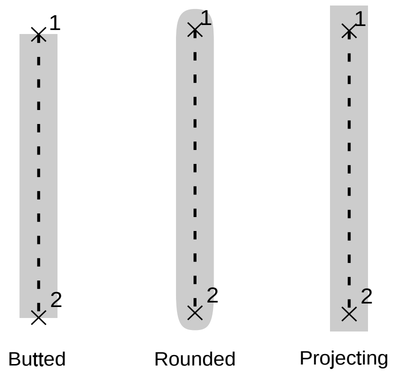
A double-dashed line is opaque. Both foreground and background colors are used. Underlying objects cannot be seen.

If you select either dashed-line-fill control, make sure you also select a dash pattern, as explained later in this section.

NOTE: Dashed lines cause much slower runtime performance in the X Window System than do solid lines, particularly for circles, arcs, ellipses, and splines.

Line cap (Butted, Projecting, Rounded)

The line-cap control determines how the ends of a line will look in any new object drawn. This is only important for thick lines where the shape of the line ending is visibly apparent. The supported cap styles are:

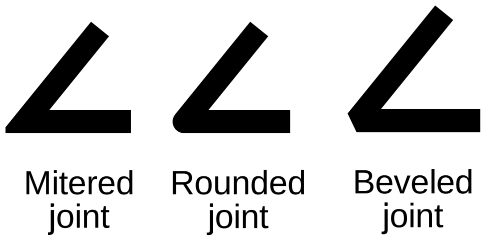


Line Cap Styles

- **Butted.** The line is truncated at the end point where you make your last click.
- **Rounded.** The line is filled past the end point a distance of half the line thickness. The line ending is rounded**.**
- **Projecting.** The line is filled past the end point a distance of half the line thickness. The line ending is square.

The line-cap control also applies to each of the line segments in dashed lines. For this reason, using a round or projecting style on very thick dashed lines may obliterate the gaps between dashes.

Line joint (Beveled, Rounded, Mitered)



Line Joint Styles

The line-joint control sets how the joint will look where two lines meet in any new objects drawn. This is only important for angled joints using thick lines where the shape of the joint is visibly apparent — including those on rectangles and polygons. The available joint styles are mitered (pointed), rounded, and beveled (flat).

Dash pattern

The dash-pattern control sets the pattern for dashed lines in any new objects drawn. This function applies only if you selected dashed , or double-dashed (transparent or opaque) as the line-fill style.

NOTE: Dashed lines cause much slower performance in the X Window System than solid lines, particularly for circles, arcs, ellipses, and splines.

Line thickness

The line-thickness control is used to set the width of the line for any new objects drawn.

NOTE: For the fastest display operation, use the smallest thickness (top line under *Line Thickness* on the *Current Line Style* panel) wherever possible. Greater thicknesses tend to slow down the display, especially for circles, arcs, ellipses, and splines.

Arrowhead settings

Any new objects with open-ended lines or splines may have arrowheads attached to them automatically, depending on the default settings. You can always add arrowheads later (see ***Adding/deleting arrowheads*** later in this chapter). If you know your format will require arrowheads, you can set the arrowhead function now.

The default arrowhead settings are toggled on or off by clicking on the buttons at the bottom of the *Current Line Style* panel. An indicator shows when the arrowhead options are turned on. Select one of the three arrowhead options:

- **Trailing arrow**. Turning on this option causes an arrowhead to appear at the starting point of any new open-ended lines or splines.
- **Leading arrow**. Turning on this option causes an arrowhead to appear at the ending point of any new open-ended lines or splines.
- **Both arrows.** Turning on both options causes the arrowheads to appear at both ends of any new open-ended lines or splines.

NOTE: This function works best with thin lines, since the arrowhead-drawing algorithm tends to distort the arrows on thick lines. However, you can manually draw arrowheads on thick lines using the Polyline Tool discussed later in this chapter.

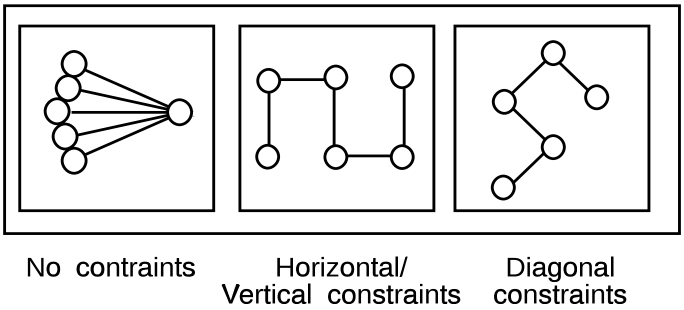
Constraints

Another option that affects how some line segments are drawn is the *Constraints* option. You can have three possible constraints:

- **No constraints**. With this option set, you can easily draw lines at *any* angle.
- **Horizontal/vertical constraints**. With this option set, you can draw exact alternating horizontal and vertical lines.
- **Diagonal constraint.** With this option set, you can draw lines at precise alternating 45-degree angles.

To display the *Constraints* panel:

1. Select the *Constraints* option from the *Style* menu on the *Format Editor Control* panel. The *Constraints* panel appears.



Line Constraint Buttons

2. Click the mouse SELECT button on one of the push buttons. The button that indicates your selection appears pushed in.

3. Click the mouse SELECT button on the *OK* button to close the pop-up panel. (To close the pop-up panel without making changes, click the mouse SELECT button on the *Cancel* button.)

NOTE: Constraints may work differently on different platforms. On some, if you start in the wrong direction after clicking a point, the rubberband line gets started in the wrong direction. On others, you must be careful to click directly on top of the expanding rubberband line to set a point.

Selecting fill styles

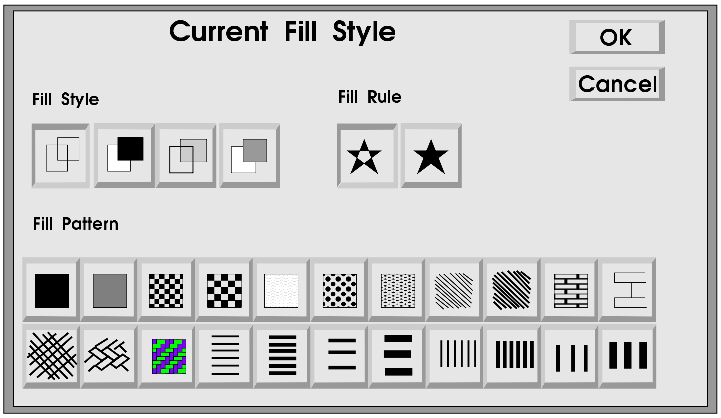
Certain objects — including circles, ellipses, arcs, rectangles, and polygons — can be filled with a solid color or a stipple pattern. Any new object of this type uses the default fill attributes shown under the *Current Fill Style* panel. These attributes control:

- Fill type (none, solid, transparent-stippled, opaque-stippled)
- Fill rule (even/odd, winding)
- Stipple pattern

You can always change fill styles for any object later (see ***Recoloring objects*** later in this chapter). To save time, however, you may prefer to set fill styles before drawing filled objects.

NOTE: Filling objects with solid or stippled fills tends to slow down system performance. Solid fill provides somewhat faster system performance than stippled fills.

To display the *Current Fill Style* panel, select the *Fill Style* option from the *Styles* menu on the *Format Editor Control* panel. The *Current Fill Style* panel appears.



Current Fill Style panel

Setting the current fill style defaults

To set the defaults for each of the controls on the *Current Fill Style* panel:

1. Click the mouse SELECT button on one of the push buttons under each of these controls. Each button that you select changes to its selected (pushed-in) state.

2. Click the mouse SELECT button on the *OK* button to close the pop-up panel. (To close the pop-up panel without making changes, click the mouse SELECT button on the *Cancel* button.)

Available fill styles (None, Solid, Stippled)

The fill style is used to control the fill for any new objects drawn in the *Drawing Area* (`$fb-bkgd`). Available options are:

- **No fill.** The outline of the object is drawn using the default line styles and foreground color. The area inside the outline of the object is transparent, allowing any other object drawn within the outline to show through.

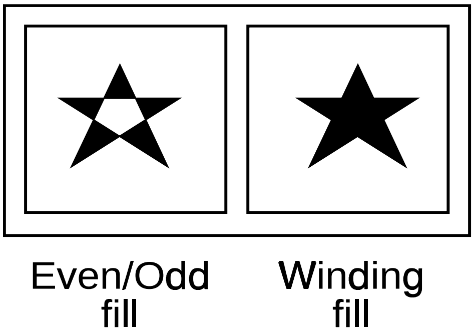
- **Solid fill.** The outline of the object is not drawn. The area inside the object is filled with the default foreground color. Objects (or parts of objects) behind this object do not display.

- **Transparent stipple**. The outline of the object is not drawn. The area inside the object is stippled (dotted) with foreground color based on the default stipple pattern. The gaps between stippling are transparent, allowing objects behind this one to show through.

- **Opaque stipple**. The outline of the object is not drawn. The area inside the object is stippled with foreground color based on the default stipple pattern. The gaps between stippling are filled with background color. Any object (or part of an object) behind this stipple does not show through.

If you set the fill type to transparent or opaque stipple, you should also select a stipple pattern; see the ***Fill pattern (Stippled)*** section.

Fill rule (Even/Odd, Winding)



The fill rule is used to control the filling of certain complex polygons, such as a five-point star, that have overlapping areas. Two options are available:

- **Even/odd.** Overlaps are not always filled.

- **Winding.** Overlaps are always filled.

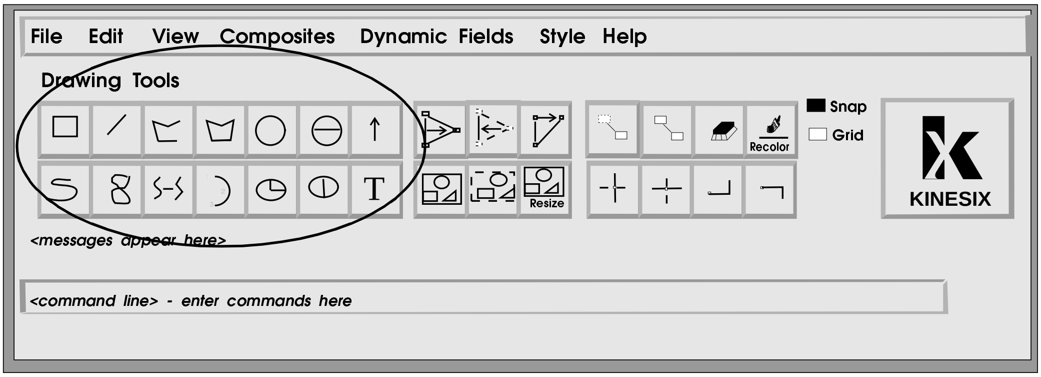
Fill pattern (Stippled)

The fill pattern is used to produce different textures or patterns for filled objects, including circles, arcs, polygons, or rectangles. In order for a fill pattern to work, you must first set the fill type to “transparent stipple” or “opaque stipple,” as described earlier.

How to draw objects

Once you have set the defaults for line style, fill style, and other attributes, you are ready to begin drawing. All static objects drawn in the *Drawing Area* (`$fb-bkgd`)will appear in the Runtime Environment in the same size and location that you draw them here, within a window of the same proportions as the *Drawing Area* (`$fb-bkgd).`

To draw an object, you must select the correct tool from the *Drawing Tools* section of the *Format Editor Control* panel, then click on two or three points in the *Drawing Area* to describe the location and shape of the object.



<messages appear here>

<command line> - enter commands here

Format Editor Control panel

Most objects can be drawn with two or three clicks of the mouse SELECT button. Lines, polygons, and splines, however, can be drawn using any number of points. For this reason, the last point on a polyline, polygon, or spline must be indicated by a click of the mouse OPTION button.

As you draw or manipulate objects, numeric coordinates appear in the *Format Editor Control* panel above the command line with the following labels:

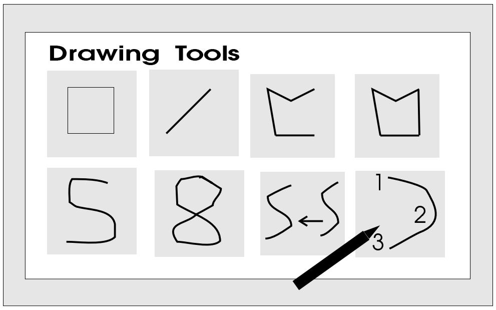
You can use these coordinates to precisely measure and control cursor movement.

x/y	**The current mouse cursor position (in pixels).**
dx/dy	The horizontal/vertical movement in cursor position since the last click (in pixels).
dist	The distance (in pixels) traveled since the last click.
theta	The angle of movement from the point of the last click.

If the *Color Palette* panel is displayed on screen, you can quickly select foreground colors for each object just before you draw them.

Remember that the default attributes discussed earlier in this chapter always apply when you draw a new object. However, you can easily change object attributes later, as explained in ***Recoloring oObjects*** later in this chapter.

Arcs/Wedges



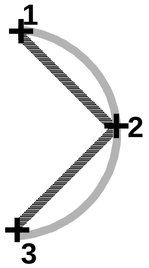
Arc Tool

With the *Arc Tool*, you draw an arc by clicking three points in the *Drawing Area*. If a solid or stippled fill style has been selected as a default attribute (see ***Selecting fill styles*** earlier in this chapter), the arc is filled like a pie wedge. Arcs may have any of the line attributes discussed earlier.

To create an arc:

1. Click on the *Arc Tool* button.

2. Move to the *Drawing Area* and begin defining the arc path by clicking the SELECT mouse button on the first, second, and third points in the *Drawing Area*.

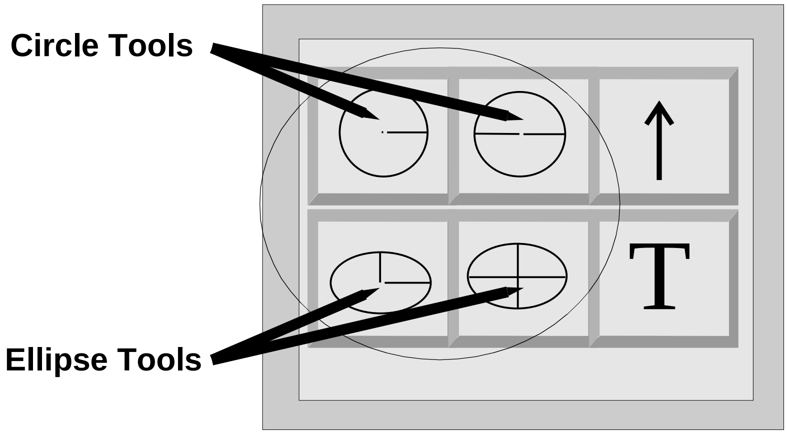


Drawing an Arc

The arc is drawn automatically using the default colors and line or fill styles shown in the bottom half of the *Drawing Tools* panel.

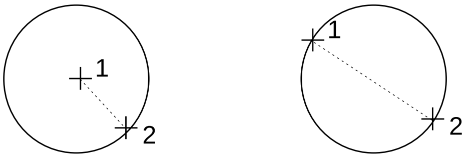
To change an arc's color, line style, or fill style, see ***Recoloring objects*** later in this chapter.

Circles/Ellipses



With the *Circle* and *Ellipse Tools*, you draw circles or ellipses by clicking two points in the *Drawing Area* (`$fb-bkgd`). This can be done in either of two ways:

- **By radius.** The first point defines the center of the object, the second point defines the circumference.
- **By diameter.** The first point defines one point on the circumference of the object, the second point defines a point on the circumference opposite the first point.



Circle by radius

Circle by diameter

Drawing a Circle

To draw a circle:

1. Click on either the *Circle Tool by Radius* or *Circle Tool by Diameter* button.

2. Click on two points in the *Drawing Area* (`$fb-bkgd`) to describe the size and location of the object, as shown by the numbers in the illustration above. A rubberband outline appears after the first click to let you visually size the object. After the second click, the object is drawn automatically, using the default colors, line and fill styles.

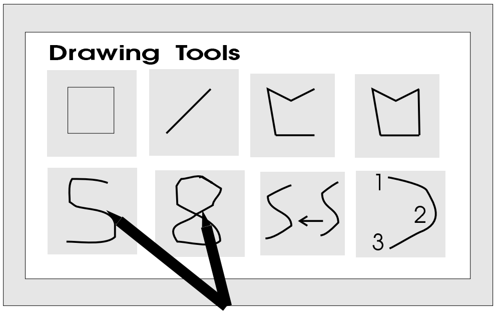
To draw an ellipse:

1. Click on either the *Ellipse Tool by Radius* or *Ellipse Tool by Diameter* button.

2. Click on two points in the *Drawing Area* (`$fb-bkgd`)to describe the size and location of the object, as shown by the numbers in the illustration above. A rubberband outline appears after the first click to let you visually size the object. After the second click, the object is drawn using the default colors, line, and fill styles.

To change the object's color, line style, or fill style, see ***Recoloring objects*** later in this chapter.

Splines (open/closed)



Spline Tools

With the *Spline Tools*, you can draw a free-form series of smooth splines that can include multiple bends in any direction. You must construct a spline by clicking in the *Drawing Area* (`$fb-bkgd`)on a series of points that define the spline's path. Splines can be either open-ended or closed. An open-ended spline stops at the last point that you click. A closed spline automatically joins the first and last points.

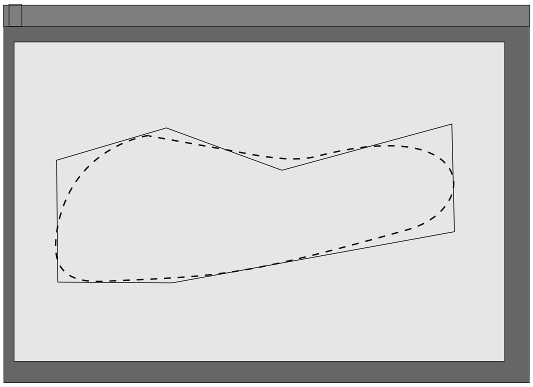
Set the line style defaults for the splines using the methods discussed earlier in this chapter. If you choose, any open splines that you draw may have arrowheads on either end of the spline. You can also use the *Line Orientation Control* functions to help you draw straight horizontal, vertical, or diagonal paths for the spline.

To draw a spline:

1. Click the mouse SELECT button on either the *Open Spline Tool* or *Closed Spline Tool* button.

2. In the *Drawing Area* (`$fb-bkgd`), click the mouse SELECT button on the first point and on any intermediate points in the spline. (You must click on at least one intermediate point.)

3. Click the mouse OPTION button on the last point.



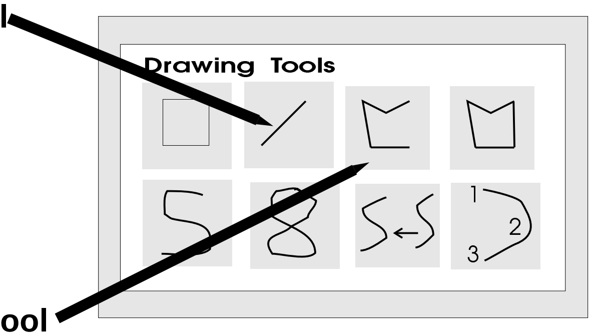
Drawing Splines

When you select the last point, the spline is drawn automatically using the default colors and line styles. To change the spline's color or line style, see ***Recoloring objects*** later in this chapter.

If you selected the *Closed Spline* option, your last point and first point are connected automatically. For best control over this final spline segment, you should have the *Snap* function turned on, and click the last point as close to the first one as possible.

Lines (single and multiple-segment)

Line Tool



Polyline Tool

With the *Line Tool*, you can draw either a single line that connects two points or multiple segment lines that connect multiple points. You construct lines by clicking on the desired points in the *Drawing Area*. Both single lines and multiple-segment lines may have arrowheads. (See ***Arrowhead settings*** later in this chapter.)

Set the default line styles using the methods discussed earlier in this chapter. You can also use the *Line Orientation Control* functions to help you draw straight, horizontal, vertical, or diagonal lines.

To draw single line segments:

1. Click the mouse SELECT button on the *Line Tool* button on the *Format Editor Control* panel.

2. In the *Drawing Area*, position the cursor on the first point and click the mouse SELECT button.

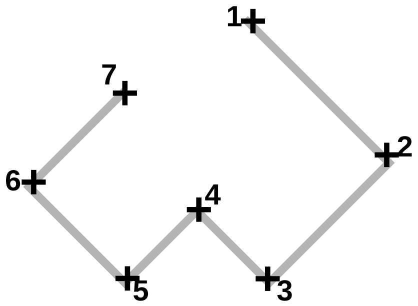
3. Move the cursor to a second point and click the mouse SELECT button; a single line is drawn between the two points.

To draw a polyline (multi-segmented line):

1. Click the mouse SELECT button on the *Polyline Tool* button on the *Format Editor Control* panel.

2. In the *Drawing Area*, click with the mouse SELECT button on the first point and on any intermediate points in a bending line.

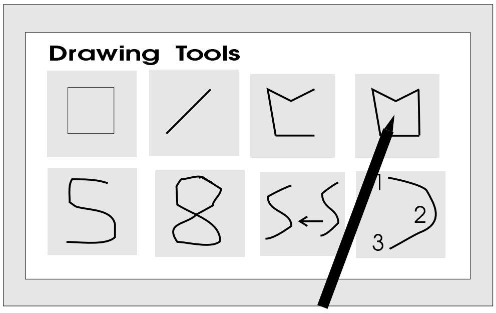
3. Click the mouse OPTION button on the last point.



Drawing a Polyline

When you click the last point, line segments are drawn using the default colors and line styles. To change colors or line styles, see ***Recoloring objects*** later in this chapter.

Polygons



Polygon Tool

With the *Polygon Tool*, you can draw multi-sided polygons by clicking on the desired location of the polygon corners in the *Drawing Area*.

Set the line or fill style defaults for the polygons using the methods discussed earlier in this chapter You can also use the *Line Orientation Control* functions for more accurate drawing of horizontal, vertical, or diagonal lines within the polygon.

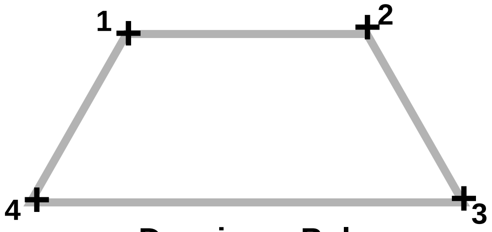
To draw polygons:

1. Click the mouse SELECT button on the *Polygon Tool* button.

2. In the *Drawing Area*, position the cursor on the desired location of the first corner and click with the mouse SELECT button.

3. Move the cursor to any intermediate corners of the polygon and click with the mouse SELECT button.

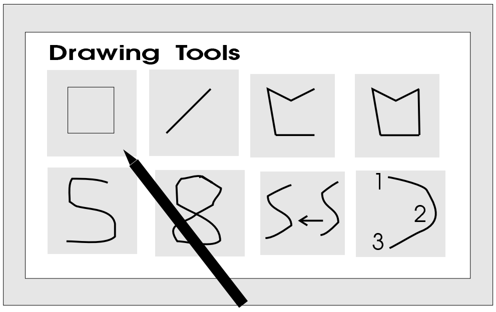
4. To finish the polygon, click the mouse OPTION button on the last corner.



Drawing a Polygon

If your first and last points do not coincide, the final side of the polygon is drawn automatically between these two points. When you select the location for the last corner, the polygon is drawn using the default colors and styles. To change the object's color, line style, or fill style, see ***Recoloring objects*** later in this chapter.

Rectangles



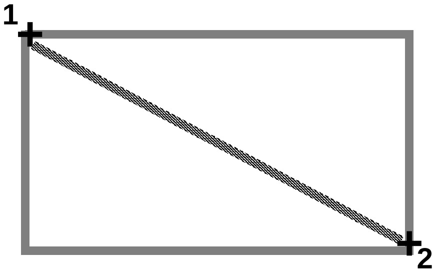
Box Tool

With the *Box Tool*, you can draw square and rectangular box shapes in the *Drawing Area* using two clicks of the mouse. The sides of the box automatically align to the horizontal and vertical.

To draw a rectangle:

1. Click the mouse SELECT button on the *Box Tool* button.

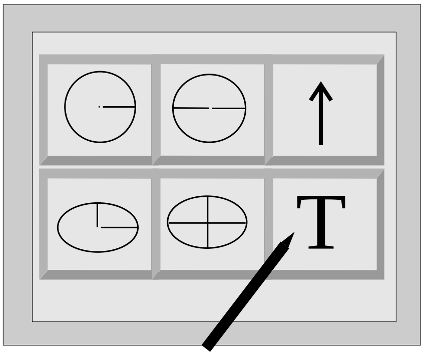
2. In the *Drawing Area*, click the mouse SELECT button on the points where you want the upper left and lower right corners of the box to appear.



Drawing a Rectangle

The box is drawn using the default colors and styles. To change the color, line style, or fill style, see ***Recoloring Objects*** later in this chapter.

Text



Text Tool

With the *Text Tool*, you add text to the *Drawing Area* by typing it in from the keyboard. Each line of text that you type is like a separate object that can be moved, copied, grouped with other objects, edited, or recolored. You can type special and international characters by using a Compose key along with the appropriate keystrokes; see ***Appendix M Special/ International Characters*** for details.

NOTE: Because of X Window System constraints, you cannot rescale or rotate text in X bitmapped fonts; you can only change fonts. However, text in scalable (vector) fonts may be scaled, flipped, and rotated. (See ***Appendix B X Bitmapped and Scalable Fonts***.)

To create text:

1. Select the desired font if different from the default.

2. Click the mouse SELECT button on the *Text Tool* button of the *Format Editor Control* panel.

3. Move the cursor into the *Drawing Area* and click the mouse SELECT button on the starting location for the text.

4. Enter the desired text and press the RETURN key.

The text appears in the current color, font, and fill style. To change the text font or color, see ***Recoloring objects*** later in this chapter.

To edit existing text:

1. Click on the *Text Tool*.

2. Then, click on the text with the mouse SELECT button where you want to start editing. You can type in new characters, or delete existing characters using the DELETE or BACKSPACE key. When you are finished, press the RETURN key or click with the mouse SELECT button.

NOTE: 1. During editing, the text may get garbled. Sometimes you can correct this with the *Redisplay* function. (See ***Redrawing all objects*** later in this chapter).
2. On some workstations, the cursor character advance is incorrect for proportional fonts.
3. If you have difficulty locating the DELETE or BACKSPACE key (or its equivalent on your keyboard), ask your system administrator.

How to manipulate objects

Once you have drawn any of the objects described on the preceding pages, you have complete control over them. You can move, copy, flip, rotate, recolor, adjust, and resize objects in any manner desired. The appropriate procedures are described below.

NOTE: Manipulated objects that are "stacked" on one another are selected from the ***top to the bottom***. When you select a single object to manipulate using the move, copy, delete, rotate, flip, resize, or recolor functions**,** click on an area on the object that does not coincide with another object. If you inadvertently select and manipulate the wrong object, immediately use the ***Undo*** option from the popup menu (displayed by pressing the mouse OPTION button in the Drawing Area) or by choosing Undo from the Edit menu.

Controlling the drawing sequence of objects

Typically, when objects are drawn on top of each other, the first one drawn is the first one displayed, followed by the second one drawn which is displayed on top of the first, etc. The **front** and **back** commands allow you to modify this sequence. You may specify the order in which graphical objects, or sets of grouped objects, are drawn on the format. This is especially important when drawing objects that are filled because they can hide objects drawn earlier.

NOTE: Dynamic fields (DFDs) are always displayed *on top of* static objects, because they are updated continuously by time-critical data.

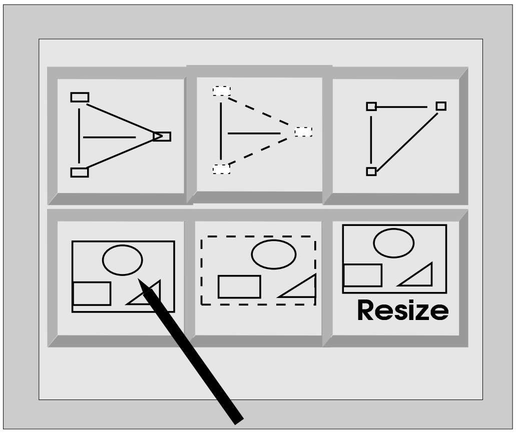
To bring object(s) to the front (top) of a drawing sequence:

1. Select the *Front* option from the *View* menu on the *Format Editor Control* panel.
2. In the *Drawing Area*, click with the mouse SELECT button on the outline of the object that you want brought to the front. Repeat this step for other objects as desired.
3. While using this option, you can click with the mouse OPTION button on objects to send them to the back.

To send object(s) to the back (bottom) of a drawing sequence:

1. Select the *Back* option from the *View* menu on the *Format Editor Control* panel.
2. In the *Drawing Area*, click with the mouse SELECT button on the outline of the object that you want sent to the back. Repeat this step for any more objects.
3. While using this option, you can click with the mouse OPTION button objects to bring them to the front.

Grouping objects



Group Tool

With the *Group Tool,* you combine objects into a group so they can be manipulated as one. For example, instead of moving several objects one at a time, you can group them and move them all at once. You can group graphical objects created using the *Format Editor Drawing Tools* with dynamic objects (DFDs), but not with scanned objects. Additionally, you can store grouped objects as a "composite" and retrieve the composite in the other formats.

To group objects:

1. Click on the *Group Tool* button on the *Format Editor Control* panel.

2. Move the cursor to the *Drawing Area* and click with the mouse SELECT button at the upper left and lower right corners of the area that includes the objects you want to group. (This is similar to using the *Box Tool*.) A grouping box encloses the group.

   With the *Preference* option from the *Edit* menu, you can select one of two possible ways for enclosing objects:

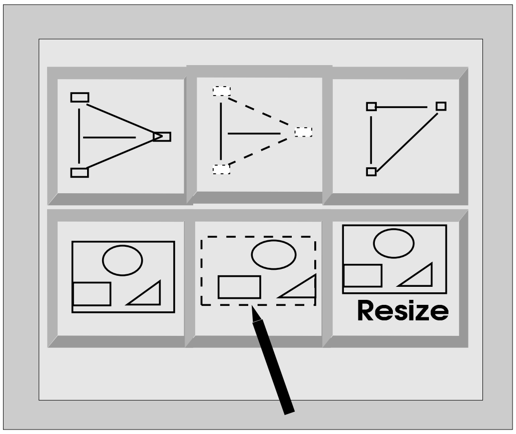
   Containment — Includes only those objects whose outlines are completely inside the grouping box. (The box usually shrinks.)

   Intersection — Includes all objects whose outlines are inside or intersected by the grouping box. (The box usually expands.)

NOTE: The grouping box is not a physical object; it appears only for grouping purposes. During operations that involve groups, all groups are shown with their grouping boxes; during other operations, grouping boxes are not shown. Even if you save the format with the objects grouped, the grouping box will not be shown in the *Sammi* window at runtime.

You select a group for performing an action on (such as, flipping, moving, resizing, copying, etc.) by clicking the mouse SELECT button either on the grouping box or on any object that is part of the group.

Ungrouping objects



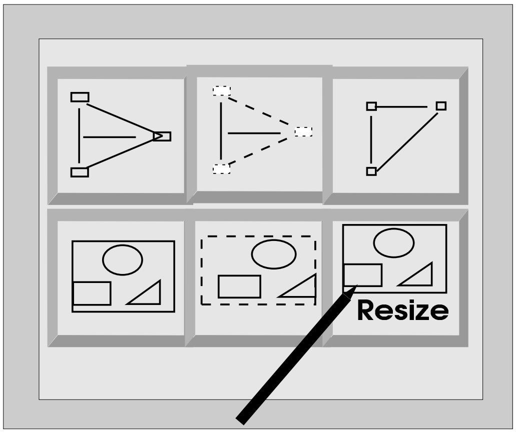
Ungroup Tool

Any set of grouped objects can be ungrouped so that you can work with them individually. To ungroup objects:

1. Click the mouse SELECT button on the *Ungroup Tool* button on the *Format Editor Control* panel.

2. Move the cursor to the *Drawing Area* and click the mouse SELECT button on the outline of the grouping box. When the grouping box disappears, the objects are no longer grouped.

Resizing objects



Resize Tool

With the *Resize Tool*, you can resize any graphical object or group of objects (except text using standard fixed fonts) to any proportion. To resize an object or group of objects:

1. Click the mouse SELECT button on the *Resize Tool* button on the *Format Editor Control* panel.

2. Move the cursor to the *Drawing Area* over the object that you want to resize and click the mouse SELECT button. A bounding box for the object, or group of objects appears.

   — To resize in one direction, click the mouse SELECT button on one of the sides (top, bottom, left, right) of the bounding box.

   — To resize objects in two directions, click the mouse SELECT button on a corner of the bounding box.

   — To shrink a bounding box, move the cursor toward the center of the bounding box.

   — To expand the bounding box, move the cursor away from the center of the bounding box.

3. Click the mouse SELECT button again when the bounding box is the desired size. Either the object is redrawn, or for a group of objects, all objects in the group (except text) are redrawn to match the new proportions of the bounding box.

You can continue resizing other objects by repeating steps 2 and 3. If you are dissatisfied with the results, immediately reverse the operation with the *Undo* function.

Resizing dynamic fields

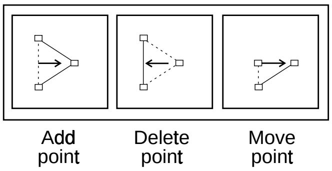
You can use the procedure described in the last section to resize DFDs also, with the following exceptions:

- If you are in *Production Editing* mode, when you resize a DFD, the *DFD Display* panel and the *AFD* panel of the display type appear. Once you resize a DFD, you must click the mouse SELECT button on the *Save DFD* button of the *DFD Display* panel in order to preserve your changes.

- To continue resizing, you must click the mouse SELECT button on the *Resize* button again.

NOTE: If you are running the Format Editor in design mode, these exceptions do not apply.

Changing points in objects



Point Tools

With the *Point Tools*, you change the size or shape of most objects by adding, deleting, or moving the control points on them. In addition, you can add or delete points on lines, polygons, and splines.

The three *Point Tool* buttons are grouped together in the middle of the top row on the *Format Editor Control* panel.

The three *Point Tools* are:

— Add Point Tool

— Delete Point Tool

— Move Point Tool

To adjust an object's shape or size:

1. Click the mouse SELECT button on one of the *Point Tool* buttons on the *Format Editor Control* panel. As soon as you select one of these buttons, control points appear on all objects in the *Drawing Area.*

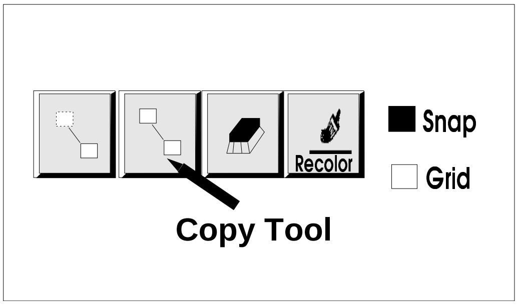
2. Move the cursor to the *Drawing Area* and click the mouse SELECT button on the control point you want to add, delete, or move. If you are deleting a control point, the point disappears and the object is redrawn. If you are adding or moving a control point, a rubberband line appears to let you relocate and set the point.

3. If you are adding or moving a control point, click the mouse SELECT button again at the new location to set the point. The object is redrawn.

Any time you are dissatisfied with the results of these operations, you can use the *Undo* function immediately to reverse it.

NOTE: You cannot add or delete points from a basic object type, that is, rectangles, curves, circles, or ellipses. While you can add points to a simple line as well as a polyline, you cannot delete points from a simple line, although you can delete points from a polyline until it becomes a simple line (with only two points).

Copying objects or groups



The *Copy Tool* lets you make duplicate copies of objects (or groups of objects) with two clicks of the mouse. The first click selects the object (or group) to be copied. The second click places the duplicate at a new location. To copy:

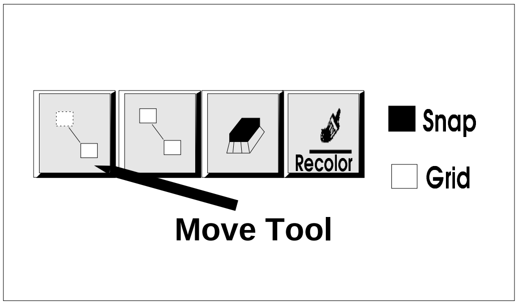
1. Click on the *Copy Tool* with the mouse SELECT button on the *Format Editor Control* panel.

   Notice that grouping boxes appear on all groups.

2. Move the cursor to the *Drawing Area* and click with the mouse SELECT button on an object, or a group of objects to be copied.

3. Click with the mouse SELECT button at the location in the *Drawing Area* where you want the duplicate to be placed. The original remains unchanged and a duplicate appears at the new location.

Moving objects or groups



The *Move Tool* lets you move objects (or groups of objects) with two clicks of the mouse SELECT button. The first click selects the object or group to be moved. The second click places that object at a new location and removes it from its previous location. To move an object or group:

1. Click with the mouse SELECT button on the *Move Tool* of the *Format Editor Control* panel.

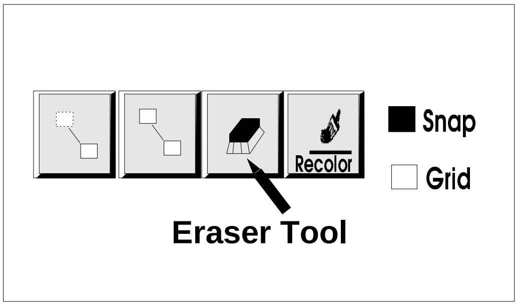
   Grouping boxes appear on all groups.

2. Move the cursor to the *Drawing Area* and click with the mouse SELECT button on an object, or group of objects to be moved.

3. Move the cursor to the new location in the *Drawing Area* and click the mouse SELECT button. The object or group is removed from the *Drawing Area* at the old location and redrawn at the new location.

If you move something by mistake, immediately reverse the operation with the *Undo* function.

Deleting objects or groups



With the *Eraser Tool*, you can delete an object or group of objects with the mouse.

To make a deletion:

1. Click the mouse SELECT button on the *Eraser Tool* on the *Format Editor Control* panel.

   Grouping boxes appear on all groups.

2. Move the cursor in the *Drawing Area* and click the mouse SELECT button on an object, or group of objects to be deleted. The object or group disappears.

If you delete something by mistake, immediately reverse the operation with the *Undo* function.

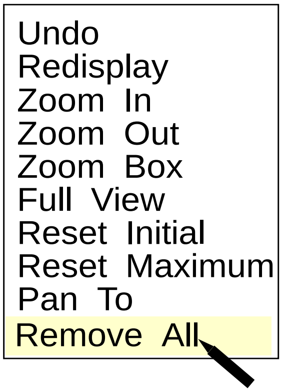
Deleting all objects

NOTE: The pop-up menu described below is not available during "unfinished" operations or operations that use the mouse OPTION button for other purposes. Drawing polylines, polygons, and open and closed splines use the mouse OPTION button to complete the figure; the front and back commands use the mouse OPTION to reverse operations; the Mirror Tools and the Arrow Tool use the mouse OPTION button for their own purposes.

With the *Remove All* option, you can clear all objects and groups from the *Drawing Area*.

To erase all objects from the *Drawing Area*:

1. Click with the mouse OPTION button anywhere inside the *Drawing Area*. The pop-up menu shown here appears.

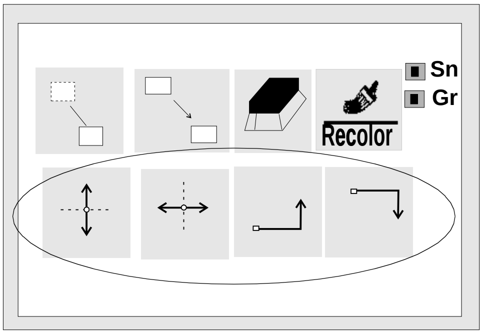


2. Move the cursor to the *Remove All* option and click the mouse SELECT button.

All objects disappear from the *Drawing Area*.

If you delete everything by mistake, immediately reverse the operation with *Undo*.

Rotating & flipping (or mirroring) objects



Mirror Tools

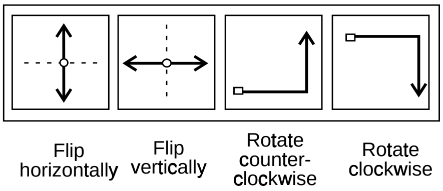
With the *Mirror Tools*, you can create a mirror image of an object or group of objects that has been flipped or rotated from the original. The original may be kept or automatically deleted, depending on which mouse button you use to select the object.

— Clicking the mouse OPTION button **removes** the original object.

— Clicking the mouse SELECT button **leaves** the original.

NOTE: You can rotate and flip text of X bitmapped fonts and dynamic objects only as part of a group. When a group containing this type of text or dynamic objects is rotated, it is moved to a new location calculated by rotating centers around the rotation point (or pick location). When this group is flipped (or mirrored), the bitmapped text or dynamic objects are simply moved. However, if you flip, rotate, or mirror text in a scalable (vector) font, the text actually flips, rotates, or mirrors the original text.

The four *Mirror Tool* buttons are grouped together on the far right in the second row of the *Format Editor Control* panel. These tools (from left to right) allow you to:



Mirror Tools

— Flip objects horizontally

— Flip objects vertically

— Rotate objects counterclockwise

— Rotate objects clockwise

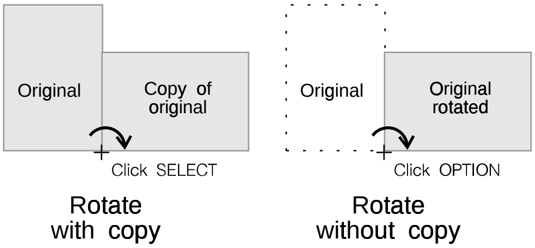
To create a flipped or rotated mirror image:

1. Click with the mouse SELECT button on one of the *Mirror Tool* buttons on the *Format Editor Control* panel.

2. Click at the desired pivot point on the object/group to create a mirrored image. Remember:

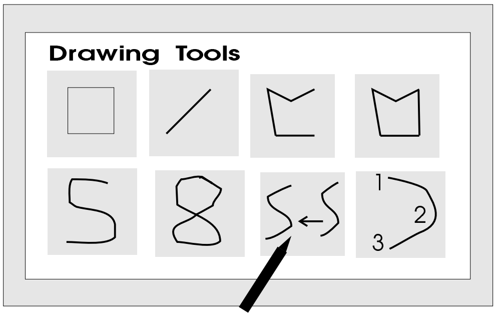
— Use the mouse SELECT button to flip or rotate the object while *leaving* the original object.

— Use the mouse OPTION button to flip or rotate the object while *removing* the original object. The object/group is flipped or rotated from the pivot point. If you are dissatisfied with the results, use the *Undo* function immediately to reverse the operation.



NOTE: Text of X bitmapped fonts subjected to this operation is mirrored, but the text does not appear reversed or inverted. Instead, only the *starting point* of this type of text is adjusted by the flip and rotate operations. Text of scalable (vector) fonts is mirrored.

Changing spline-to-line or line-to-spline



Spline-to-line Tool

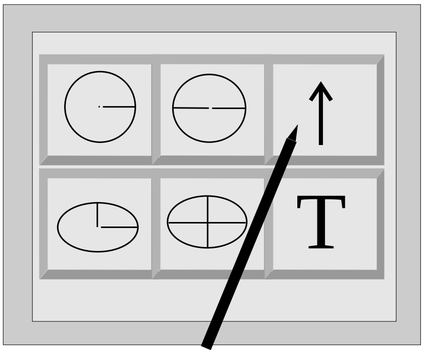
You can change any spline to a polyline and any polyline to a spline. This option works only for multi-segment lines (polylines) and splines drawn with the *Spline Tool*.

To convert splines to lines and vice versa:

1. Click with the mouse SELECT button on the *Spline-to-Line Tool* button of the *Format Editor Control* panel.

2. Move the cursor to the *Drawing Area* and click with the mouse SELECT button on the lines or splines you want to convert. Each time you click on a polyline, it is converted to a spline; and each time you click on a spline, it is converted to a polyline.

Adding/deleting arrowheads



Arrow Tool

With the *Arrow Tool*, you can add or delete arrowheads at the tip of any open line (including those on the ends of splines and hollow arcs).

NOTE: The *Arrow Tool* works best on thin or medium lines. Due to the small size of the arrowhead generated using the arrowhead-drawing algorithm, arrowheads are distorted on thick lines. However, you can draw adequate arrowheads on thick lines using the Polyline Tool .

To use this tool:

1. Click the mouse SELECT button on the *Arrow Tool* button of the *Format Editor Control* panel.

2. Move the cursor to the *Drawing Area* and click on the end of the line where you want an arrowhead added or deleted.

   — Clicking the mouse SELECT button **adds** an arrowhead.

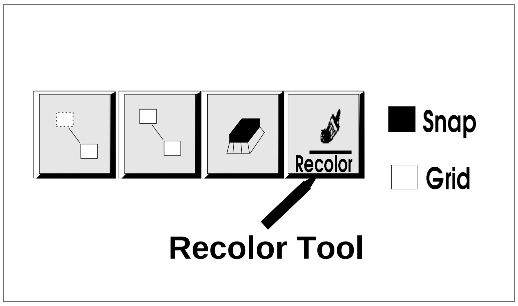
   — Clicking the mouse OPTION button **deletes** an existing arrowhead.

NOTE: If you had set the default arrowhead function with the *Line Style* option from the *Style* menu for arrowheads, and you find that you do not need some arrowheads, delete them with this option.

As you work...

Any of the operations discussed on the following pages may be performed as you work in the *Drawing Area*.

Recoloring objects



Recoloring often involves much more than just changing the color of an object. When you use the *Recolor* function in its simplest form, you are actually resetting the object to *all* current default colors, fonts, line styles, and fill styles.

The *Recolor* function allows you to change the font of already-entered text. For these reasons, the *Recolor* function is a quick and easy way to make multiple changes in appearance to a series of objects (even those in groups).

To use the simple form of the *Recolor* function to modify objects:

1. Set all colors, lines styles, and fill styles exactly as you want them to be applied to the object(s) being changed.

2. Select the *Recolor* button under the *Drawing Tools* on the *Format Editor Control* panel.

3. Move the cursor to the *Drawing Area* and click on the object to effect the change. Repeat this step for any other object you want to change.

NOTE: If an object fails to change, either it already has the default attributes or you did not click on the correct area. First, try turning off the *Snap* option on the *Format Editor Control* panel. Then try clicking directly on a corner, outline, or control point. For text, try clicking at the beginning of the line.

Modifying a single attribute

You can also modify objects by changing one or more display attributes without changing all the object's defaults by using Format Editor commands or selections from the Style menu of the Format Editor Control panel.

To modify a single attribute of an object:

1. Set the attributes (*Color, Font, Line Style*, and *Fill Style*) exactly as you want it to be applied to the object being changed.

2. Select the *Static Attrib* option from the *Edit* menu on the *Format Editor Control* panel.

3. From the resulting cascading menu, select the attribute you are changing. Your options are *Color*, *Line Style*, *Fill Style*, *Font*, or *All Attributes*.

4. Move the cursor to the *Drawing Area* and click the mouse SELECT button on the object to effect the change. Repeat this step for any other object that you want to change.

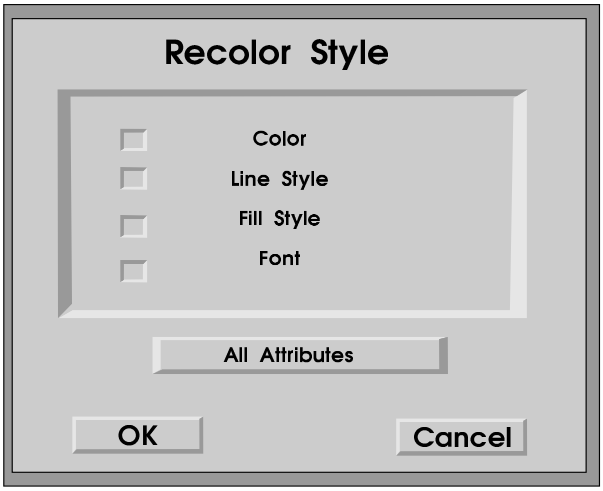
NOTE: Be aware that when you select a single attribute, this is the only attribute that will be used in subsequent *Recolor* operations, until you change the selected attribute or select the *All Attributes* function.

Modifying several attributes

To modify several attributes of an object in one operation:

1. Set the attributes (colors, fonts, line styles, and fill styles) exactly as you want them to be applied to the object(s) being changed.

2. Select the *Recolor...* option from the *Style* menu on the *Format Editor Control* panel. The *Recolor Style* panel appears. Each button represents an attribute that you can reset.



3. Click the mouse SELECT button on each button to change the associated attribute, or use the *All Attributes* button to select all.

4. Click the mouse SELECT button on the *OK* button at the bottom of the panel.

5. Select the *Recolor* button under the *Drawing Tools* on the *Format Editor Control* panel.

6. Move the cursor to the *Drawing Area* and click on the object that you want to change. Repeat this step for any other object you want to change.

When you want to remove the Recolor dialog panel from the screen, select the Cancel button at the bottom of the panel. The dialog panel disappears, and the last attributes changed stay in effect as defaults.

Undoing mistakes

The Undo function reverses the last operation completed.

To use Undo:

1. Open the Edit menu on the *Format Editor Control* panel and select Undo.

2. To reverse an Undo; simply select the Undo option from the Edit menu again.

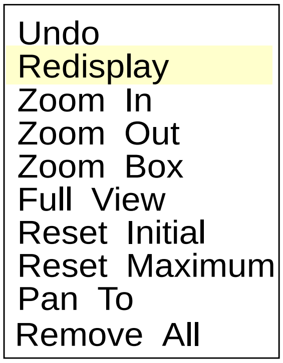
NOTE: You can also click the mouse OPTION button anywhere inside the *Drawing Area*; select Undo from the popup menu that displays. This pop-up menu is not available during "unfinished" operations or operations that use the mouse OPTION button for other purposes. Drawing polylines, polygons, and open and closed splines use the mouse OPTION button to complete the figure; the front and back commands use the mouse OPTION to reverse operations; the Mirror Tools and the Arrow Tool use the mouse OPTION button for their own purposes.

Redrawing/cleaning up the Drawing Area

Occasionally, as you draw and manipulate objects, some objects are not completely redrawn or erased completely. You can redraw all objects in the Drawing Area using the Redisplay option.

To redraw all objects:

1. Click the mouse OPTION button anywhere inside the Drawing Area. A popup menu displays.



2. Move the cursor over the Redisplay option on the menu and click the mouse SELECT button. All objects are redrawn.

Scaling or shifting the entire format

You can scale and/or move all static objects and dynamic fields in a format simultaneously.

NOTE: Re-scaling does **not** work on text of a standard fixed font**.**

To scale, enter the following command in the Command line of the *Format Editor Control*:

```
scale-format <x scale> <y scale> <x position> <y position>
```

where:

`<x scale>`	The horizontal scaling factor. A value of 100(%) maintains current scale.
`<y scale>`	The vertical scaling factor. A value of 100(%) maintains current scale.
`<x position>`	The horizontal offset in pixels (positive number = right shift).
`<y position>`	The vertical offset in pixels (positive number = downward shift).

WARNING: The scaling factor in the Format Editor has a maximum limit of 5,000 percent. There is no limit to the minimum size for scaling; however, if a format is scaled down and then scaled back, objects in the format may not recover their original shape and/or position.

Entering a number which causes the objects to shift outside the *Drawing Area* means you must resize the window to view the objects.

To shrink all objects to half (50%) their current sizes, you would enter the following command:

```
scale-format 50 50 0 0
```

To double the vertical scale of the objects while retaining the same horizontal proportions, you would enter the following command:

```
scale-format 100 200 0 0
```

To shift all objects to the right by 20 pixels and up by 50 pixels (without changing scale), you would enter the following command:

```
scale-format 100 100 20 -50
```

Special effects and advanced methods

Once you understand how to draw with the Format Editor, you can use several advanced functions to improve your illustrations. These are explained on the following pages.

Using scanned images

Many drawing steps can be omitted by scanning drawings directly into the Format Editor using the background image function. A background image becomes an immobile part of the drawing that you can embellish with manually drawn static objects. For more information on importing background images, see ***Using background images*** in ***Chapter 4*** of this manual.

Converting static objects to dynamic objects

Any static object drawn with the Format Editor tools can be converted to a dynamic object using the Dynamic Object display type explained in ***Chapter 7***. Dynamic objects can be designed to change color, blink, rotate, and change line style or fill style in response to incoming data. For example, you might have a group of objects designed to look like a storage tank that turns red and starts blinking when incoming data shows that the storage tank it represents is empty.

Using composites

During the design and development of formats, you might want to use certain groups of static objects and dynamic fields repeatedly. With the *Composite* function of the Format Editor, you can readily group and save these groups.

When you save a composite, it is stored in the same directory as formats, usually `$SAMMI/data (or /demo or /user)` directory, but with the `.prt` extension which distinguishes it from a format.

NOTE: Your pathname may be different; check with your system administrator.

Creating composites

To create a composite to be used in several formats, the *Format Editor Control* panel must be displayed on your screen and you must be logged in and editing a format, either new or existing.

1. Draw the static objects using the *Format Editor Drawing Tools*, as explained earlier in this chapter.

2. Using the methods described in ***Chapter 6*** and ***7***, add any dynamic fields you want included in the composite.

3. Group the static objects and dynamic fields together using the *Group Tool.*

4. Select the *Save Composite* option from the *Composites* menu on the *Format Editor Control* panel. The following message appears in the message line of the *Format Editor Control* panel:

   ```
   Select the composite to save
   ```

5. Move the cursor in the *Drawing Area*, and click the mouse SELECT button on the bounding box of the group. The group is highlighted, and the *Save Composite* dialog box appears.

6. Either enter a new name for the composite you have just selected, or select the name from the scrollable list of existing composites to overwrite.

7. Click the mouse SELECT button on the *OK* button.

To save more composites, repeat steps 4 through 6.

Retrieving composites

To read a composite into your format (new or existing):

1. From the Format Editor Control panel, load your format in the *Drawing Area* with the *Open* option on the *File* menu, or select the *New* option to create a new format.

2. Select the *Read Composite* option from the *Composites* menu of the *Format Editor Control* panel.

3. Either enter the name (without extension) of an existing composite, or select the name from the scrollable list that appears.

4. Click the mouse SELECT button on the *OK* button.

5. Move the cursor to the *Drawing Area* where the cursor changes into a bounding box the size of the composite.

6. Move the cursor with the bounding box to where you want to place the composite and click the mouse SELECT button.

NOTE: Composites are read into your format as a group. To modify parts of the composite, you must first ungroup the composite.

Deleting composites

To delete a composite:

1. From the Format Editor Control panel, select the *Delete Composite* option from the *Composites* menu of the *Format Editor Control* panel.

2. Either enter the name (without extension) of an existing composite, or select the name from the scrollable list that appears.

3. Click the mouse SELECT button on the *OK* button.

When the confirmation panel appears, click on the *Yes* button.

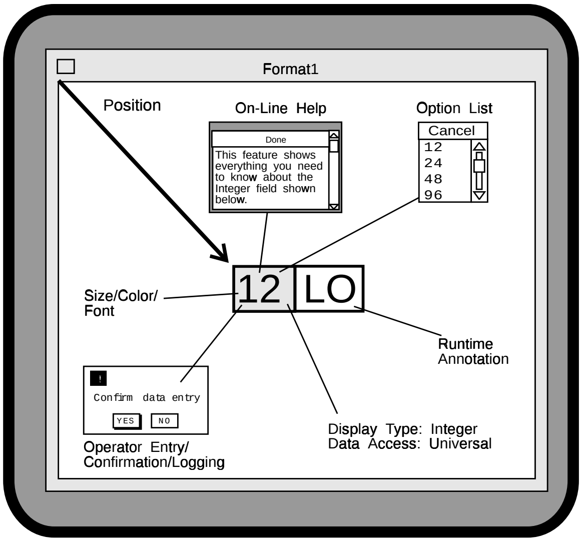
CHAPTER 5-150 Drawing Methods

Dynamic Field Description

Dynamic fields are the most important part of any format that you design using the Format Editor. For each dynamic field, you must make a number of important decisions, including:

- How should the dynamic field work? Should it provide on-line help, pop-up option lists, or logging? If dynamic data are involved, how should they be accessed and updated? Should the user be allowed to change the data? Should such changes be confirmed and/or logged in an event file?
- How should the dynamic field look? What display type should be used (meter, graph, etc.)? What should be its size and position in the format? What color should it be? What font should be used for text?

The illustration below shows how such decisions are applied to a typical dynamic field. You enter the parameters on the *Dynamic Field Description (DFD) Display* panel, which also includes general information about the dynamic field, the display type, and data access type:



This feature shows everything you need to know about the Integer field shown below.

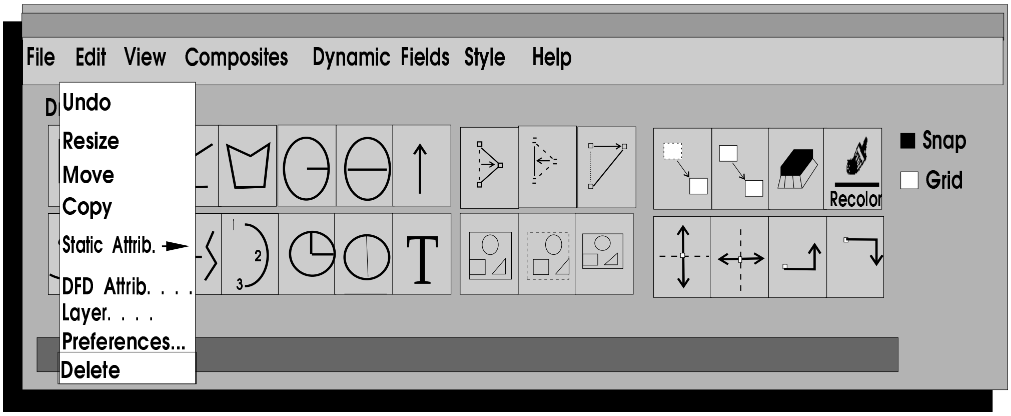
Display Type: Integer
Data Access: Universal

Understanding Dynamic Field Description

This chapter explains how to enter general information about the dynamic field. ***Chapters 7*** and ***8*** provide more detail on display types and data access types.

General procedures

Dynamic fields are created and manipulated using the *Edit* menu and the *Dynamic Fields* menu at the top of the *Format Editor Control* panel.



***Edit* Menu of *Format Editor Control* panel**

Actions available from these two menus are:

Edit Menu Selections

Option	**Action**
Undo	Reverse the last edit operation. This option is the same as the *Undo* option on the option list.
Resize	Change the size of an object. This option has the same function as the *Resize* button on the *Format Editor Control* panel.
Move	Move an existing object to another location within the format.
Copy	Make an exact copy of an existing object. After the copy is made, you may “relocate” it to another area on the format.
Static Attrib	Edit the attributes of an existing static object.
DFD Attrib	Edit the attributes of an existing dynamic field.

Edit Menu Selections (continued)

Option	Action
Layer	Display the *Layer Display* panel.
Preferences	Set operational preferences.
Delete	Delete an existing DFD (or static object) from the format.

Dynamic Fields Menu Selections

Option	Action
Display Palette	Display a "palette" of push buttons from which you can select pre-defined dynamic fields.
Read DFD Lib.	Read a FWDU_LIBRARY_BINARY from the MDB. When the Read_Lib_popup appears enter the complete Pathname.
Save DFD Lib.	Write a FWDU_LIBRARY_BINARY in the MDB. When the Save_Lib_popup appears enter the complete Pathname.
Add DFD	Create a dynamic field, deferring type and attribute specification until after you place and size the new dynamic field on the format.

Each of these functions is initiated by selecting the appropriate menu, then selecting the appropriate option from the resulting pull-down menu. Procedures for performing each function are discussed on the following pages.

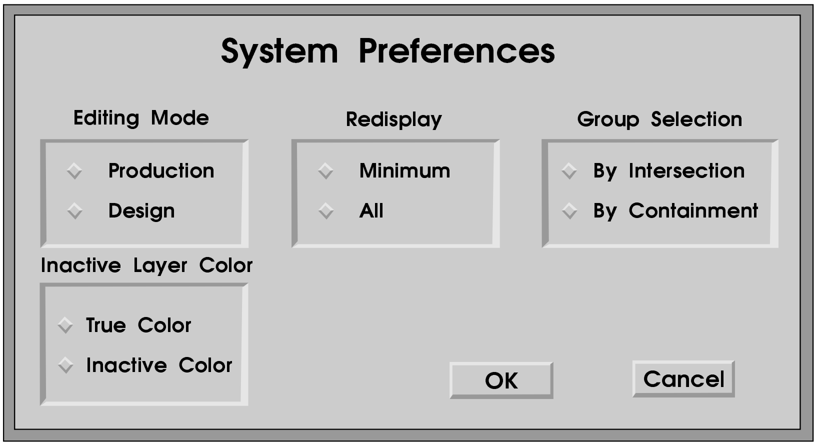
These procedures cover only the basic aspects of dynamic fields. More information about entering specific details is included later in this chapter and in ***Chapters 7*** and ***8***.

As with graphical objects, DFDs that are part of a group (or composite) may not be edited, moved, copied, etc. The group (or composite) first must be separated into individual objects using the *Ungroup Tool* under the *Drawing Tools* section of the *Format Editor Control* panel.

NOTE: The name and type of an editable DFD are displayed in the message area of the *Format Editor Control* panel when you move the cursor into the DFD.

Setting operational preferences

You can define or redefine the operational mode of the Format Editor with the *System Preferences* panel. To display this panel, select the *Preferences* option from the *Edit* menu on the *Format Editor Control* panel. To make a selection, click the mouse SELECT button on one of the buttons below each title.



When you finish making your selections, click the mouse SELECT button on the *OK* button to save your preferences, or to close the panel without changing the current settings, click the mouse SELECT button on the *Cancel* button.

System Preferences Entries

Entry Option **Description**

Editing mode

Determines which panels are displayed when you edit a DFD:

Production mode. Displays the DFD attributes panels during all DFD operations. When you finish editing a format, you must explicitly save the DFD by clicking on the *Save DFD* button on the *DFD Display* panel. Panels remain displayed during DFD operations and are removed only when the *Cancel DFD* button in the *DFD Display* panel is selected, or when they are being replaced by another panel, (for instance, when DFD types are changed). This is the default mode.

Design mode. Inhibits the display of the DFD attributes panels during most DFD operations and automatically saves DFDs when they are added (from the palette or by the *Read DFD Lib* option). The panels are displayed only when you select the *DFD Attributes* option from the *Edit* menu or when you select the *Add DFD* option from the *Dynamic Fields* menu. The panels are removed when you click the mouse SELECT button on the *Save DFD* button or the *Cancel DFD* button on the *DFD Display* panel.

System Preferences Entries (continued)

Entry Option — **Description**

Redisplay

Determines the amount of the *Drawing Area* that is redrawn after an editing operation. This option has no effect on the *Redisplay* option of the *View* menu, or the *Redisplay* selection from the *Drawing Area* pop-up option menu, as those two options always redraw the entire *Drawing Area*.

Minimum redisplay. Redraws only those objects that you have just edited. If you move an object or change an object's default that impacts other objects, those changes will not be reflected until you select either the *Redisplay* option from the *View* pull-down menu or the *Redisplay* selection from the pop-up menu. This is the default option.

All redisplay. Redraws the entire *Drawing Area* after each editing operation. This has the same effect as performing the *Redisplay* option of the *View* menu or the *Redisplay* selection from the pop-up menu.

Group Selection

Determines which objects are grouped together when you use the *Grouping Tool.*

By Intersection. All objects intersected or bounded by the grouping box are included in the group.

By Containment. All objects completely enclosed in the grouping box are included in the box. This is the default option.

Inactive Layer Color

Determines how objects are colored when they are on an inactive layer.

True Color. All objects are their actual color and fill, even if they are on an inactive layer.

Inactive Color. Objects on an inactive layer are unfilled and are shown as outlines only.

Adding a new dynamic field

You can add one or more new dynamic fields to any format. To do this, you must be currently editing the format using the *New* or *Open* option from the *File* menu.

You can add dynamic fields by any of three methods:

- ***Add DFD.*** This option allows you to create a DFD by making entries in each field of the *DFD Display* panel.
- ***Display Palette.*** This option displays a panel of buttons from which you select a specific (existing) DFD type.
- ***Read DFD Lib.*** This option displays a selection list of existing DFD libraries from which you can make a selection.

The latter two methods provide more default parameters on the *DFD Display* panel than appear when you choose the *Add DFD* option.

Add DFD option

To use the *Add DFD* option, follow these steps:

1. Select the *Add DFD* option from the *Dynamic Fields* menu on the *Format Editor Control* panel.

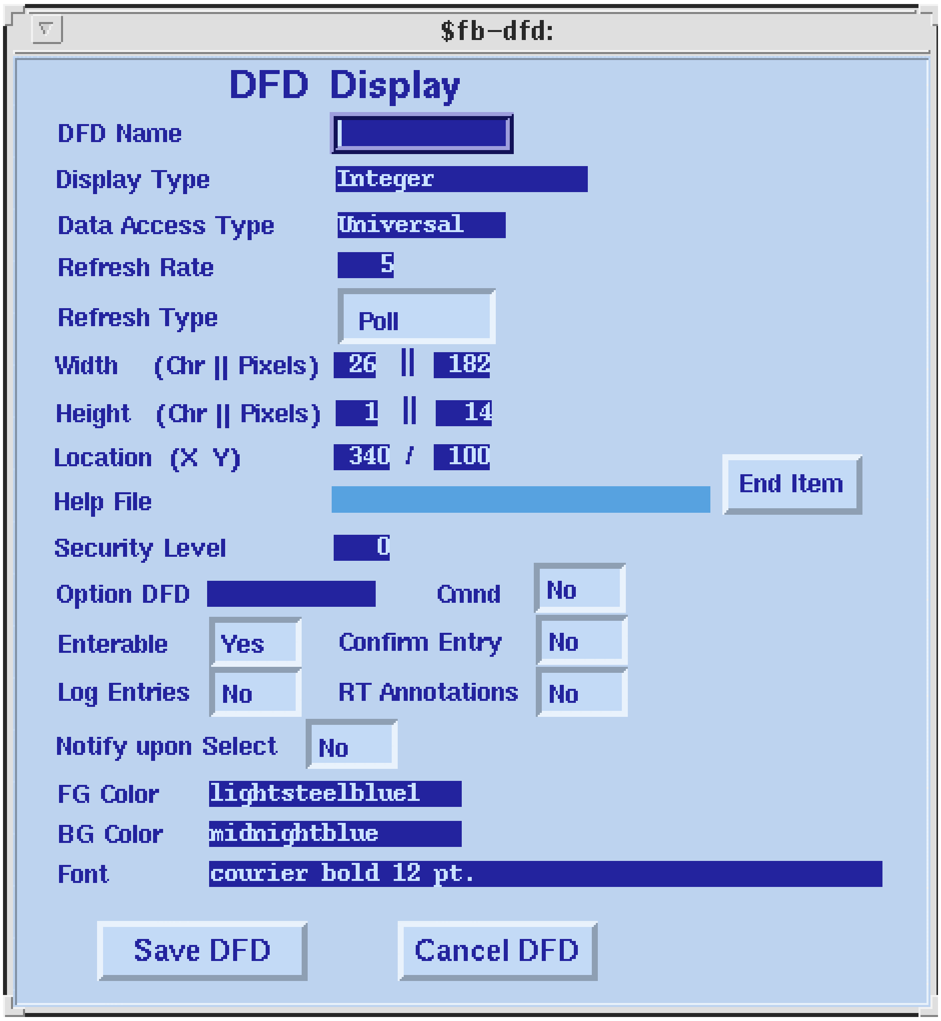
2. In the *Drawing Area*, click the mouse SELECT button to position the upper left corner of the DFD.

3. Move the cursor down and to the right to size the DFD, and click the mouse SELECT button again.

Or, you can specify the width and height of the DFD by entering in the values in the *DFD Display* panel; see the next step.

4. To display the *DFD Display* panel, double-click the mouse SELECT button on the upper left corner of the DFD.

5. Now make the appropriate entries in the *DFD Display* panel and press the RETURN key.



$fb-dfd:

DFD Display

DFD Name

Display Type: Integer

Data Access Type: Universal

Refresh Rate: 5

Refresh Type: Poll

Width (Chr || Pixels): 26 || 182

Height (Chr || Pixels): 1 || 14

Location (X Y): 340 / 100

Help File

Security Level: 0

Option DFD

Cmnd: No

Enterable: Yes

Confirm Entry: No

Log Entries: No

RT Annotations: No

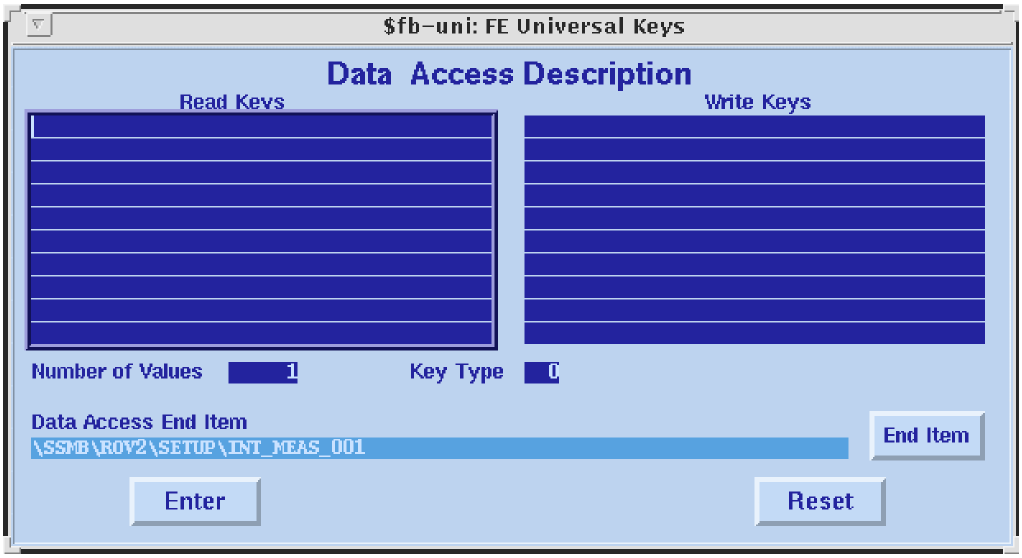
Notify upon Select: No

FG Color: lightsteelblue1

BG Color: midnightblue

Font: courier bold 12 pt.

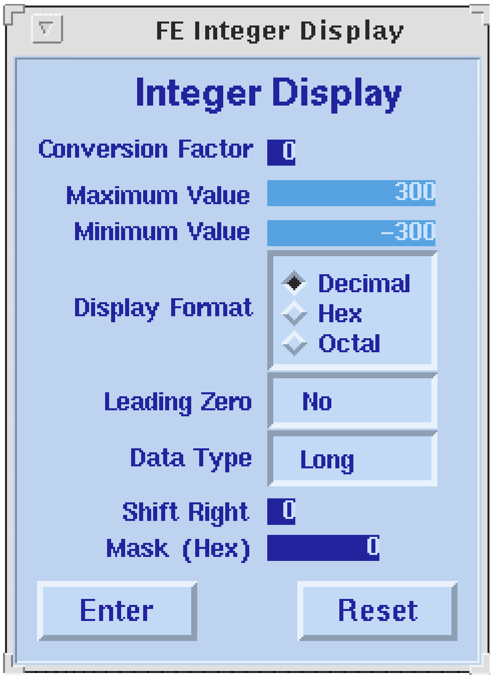
Depending on your entries, the appropriate display type panel and/or *Data Access Description* panel will appear, as shown in the following illustrations:



Number of Values 1

Key Type 0

Data Access End Item \SSMB\ROV2\SETUP\INT_MEAS_001



Conversion Factor 0

Maximum Value 300

Minimum Value -300

Display Format ● Decimal ○ Hex ○ Octal

Leading Zero No

Data Type Long

Shift Right 0

Mask (Hex) 0

6. Fill in any additional panels using the guidelines in ***Chapter 7 Display Types*** and ***Chapter 8 Data Access Types***.

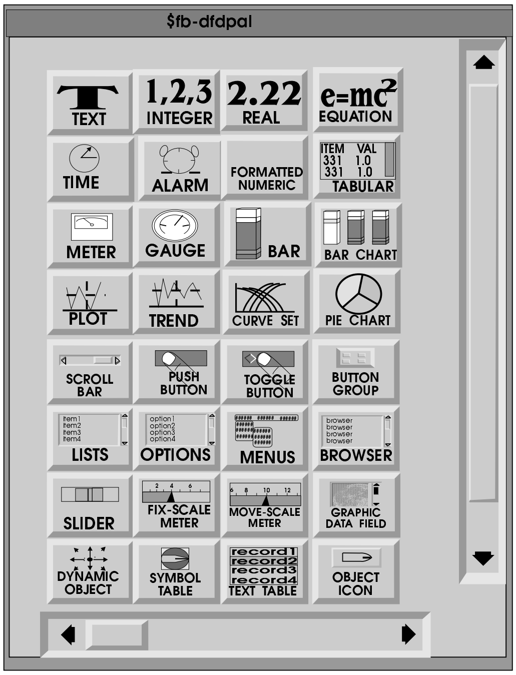
7. Click the mouse SELECT button on the *Save DFD* button on the *DFD Display* panel to save your entries. If you wish, you can add more dynamic fields by returning to step 2.

8. To quit adding dynamic fields, select another editing option. If you do not click the mouse SELECT button on the *Save DFD* button before you click the mouse SELECT button on the *Cancel DFD* button, any changes that you have made are discarded.

Display Palette option

To use the *Display Palette* option:

1. Select the *Display Palette* option from the *Dynamic Fields* menu on the *Format Editor Control* panel. The following panel appears.



Scroll bars allow you to move down and to the right on this panel for more selections, or you can resize the *DFD Palette* panel.

2. Click the mouse SELECT button on the button for the display type you want to create.

3. Move the cursor to the *Drawing Area*. The cursor style changes to the icon of the DFD you have selected.

   A bounding box is attached to the cursor and follows it as you move about the *Drawing Area*. This bounding box is the actual size of the pre-defined dynamic field.

4. Position and set the dynamic field on the *Drawing Area* by clicking the mouse SELECT button again. If you are in *Production Editing Mode*, the *DFD Display*, the dynamic type description, and *Data Access Definition* panels appear.

NOTE: If you set the *Editing Mode* on the *System Preferences* panel to *Design*, the next step does not apply.

5. Make appropriate entries in these panels.

6. Click the mouse SELECT button on the *Save DFD* button of the *DFD Display* panel to save your entries. If you wish, you can add more dynamic fields by returning to step 2.

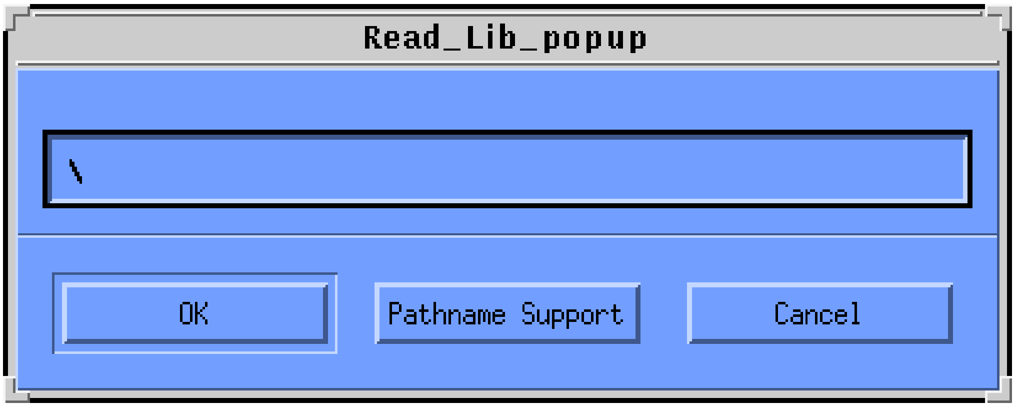
WARNING: If you do not click the mouse SELECT button on the *Save DFD* button before you change to another editing function, any changes that you made are lost.

To quit adding dynamic fields, select another editing function.

Read DFD Lib option

To use the *Read DFD Lib* option, follow these steps:

1. Select the *Read DFD Lib* option from the *Dynamic Fields* menu on the *Format Editor Control* panel. The following window appears:.



2. Enter a FWDU_LIBRARY_BINARY. Press OK

3. Move the cursor to the *Drawing Area*.

   Note that a bounding box is attached to the cursor and follows it as you move about the *Drawing Area*. This bounding box is the actual size of the pre-defined dynamic field.

4. Position and set the dynamic field on the *Drawing Area* by clicking the mouse SELECT button. If you are in *Production Editing Mode*, the *DFD Display*, the dynamic type description, and *Data Access Definition* panels appear.

NOTE: If you set the *Editing Mode* on the *System Preferences* panel to *Design*, the next step does not apply.

5. Make appropriate entries in the panels that appear. (Refer to ***Chapter 7 Display Types*** and ***Chapter 8 Data Access Types*** for details.)

6. Click the mouse SELECT button on the *Save DFD* button to save your entries. If you wish, you can add more dynamic fields by returning to step 2.

WARNING: If you do not click the mouse SELECT button on the *Save DFD* button before you change to another editing function, any changes that you made are lost.

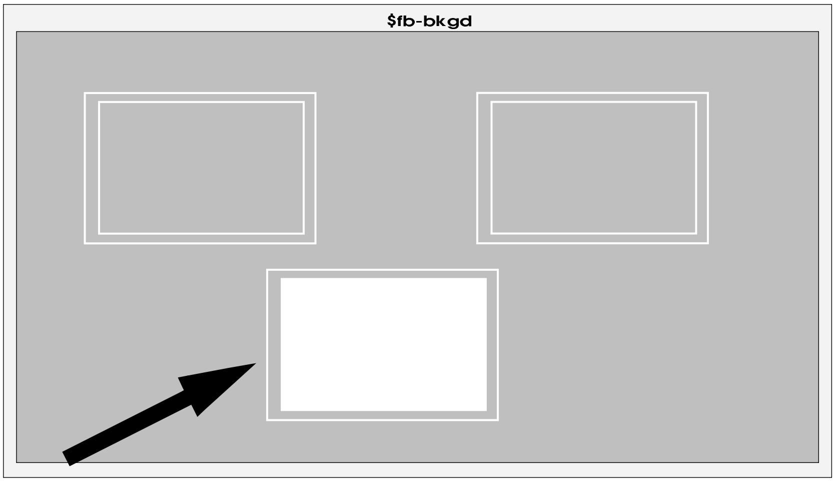
To quit adding dynamic fields, select another editing function.

Changing existing dynamic fields

To change an existing dynamic field, you must be currently editing the format using the *New* or *Open* option. To change dynamic fields:

1. Select the *DFD Attributes* option from the *Edit* menu on the *Format Editor Control* panel.

   All existing dynamic fields in the *Drawing Area* appear as white outline double boxes (see illustration).



Selecting the Dynamic Field To Be Changed

2. Click the mouse SELECT button on the dynamic field to be changed. To help in selecting the dynamic field, the name and type of the dynamic field is displayed in the *Format Editor Control* panel message line when your cursor is moved to the white double outline bounding box.

The selected field turns white and the appropriate description panels appear. You can change any of these panels by clicking on the entry to be changed and entering the new information.

— To change entries on the *DFD Display* panel, see ***Entering dynamic field entries*** later in this chapter.

— To change entries on a dynamic field display type panel, see the appropriate specifications in ***Chapter 7***.

— To change entries on the *Data Access Description* panel, see the appropriate specifications in ***Chapter 8***.

3. Click the mouse SELECT button on the *Save DFD* button to save your entries and quit changing the dynamic field. You may continue to change dynamic fields by returning to step 2 above.

WARNING: If you do not click the mouse SELECT button on the *Save DFD* button before you change to another editing function, any changes that you have made are lost.

When you are finished changing all dynamic fields desired, select another editing function.

Deleting dynamic fields

You can delete any dynamic field that has already been created and saved. To do so, you must be currently editing the format using the *New* or *Open* option from the *File* menu of the *Format Editor Control* panel (see ***Chapter 2 General guidelines for using the Format Editor***). To delete dynamic fields, follow these steps:

1. Either select the *Delete* option from the *Edit* menu, or click the mouse SELECT button on the *Eraser Tool* button of the *Format Editor Control* panel.

   All existing dynamic fields are shown as double-lined bounding boxes in the *Drawing Area,* and the cursor turns into a double cross.

2. Click the mouse SELECT button on the dynamic field you want to delete.

   The dynamic field is removed.

NOTE: If you delete a dynamic field by mistake, use the *Undo* function immediately to reverse the operation.

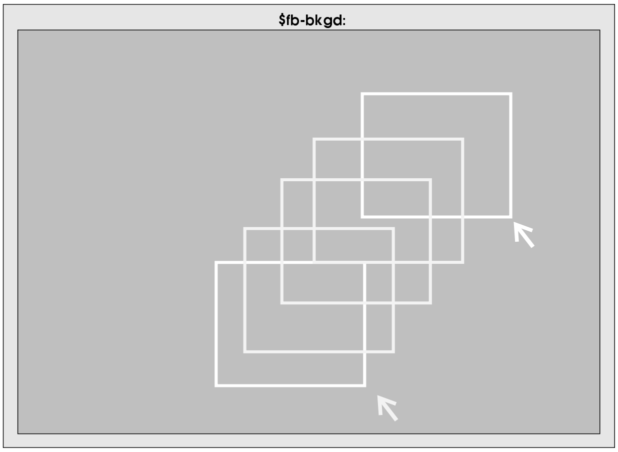
You can delete more fields by repeating step 2, or you can end the delete function by selecting another editing function.

Moving dynamic fields

To move an existing dynamic field to another location in the format, you must be currently editing the format using the *New* or *Open* option. To move a dynamic field, follow these steps:

1. Either select the *Move* option from the *Edit* menu or click the mouse SELECT button on the *Move Tool* button of the *Format Editor Control* panel.

2. Click the mouse SELECT button on the border of the dynamic field that you want to move. The dynamic field "selected" is highlighted.



Moving a Dynamic Field

3. Move the cursor to the new location for the dynamic field.

   The highlighted box should move to indicate the size of the dynamic field. If it does not, repeat step 2.

NOTE: Turning off the *Snap* feature (bottom of *Drawing Tools* panel) may make it easier to select a dynamic field that is difficult to select. Be sure to turn *Snap* back on if you need it for drawing or alignment.

4. When the highlighted box reaches the desired location, click the mouse SELECT button again. The highlighted box should remain fixed at the desired location.

You can move more fields by repeating steps 2, 3, and 4, or you can end the move function by selecting another editing function.

Copying dynamic fields

To make a copy of an existing dynamic field, you must be currently editing the format using the *New* or *Open* option. To copy a dynamic field, follow these steps:

1. Either select the *Copy* option from the *Edit* menu or click the mouse SELECT button on the *Copy Tool* button of the *Format Editor Control* panel.

   All existing dynamic fields are shown as double-line bounding boxes in the *Drawing Area*, and the cursor turns into a hand.

2. Click the mouse SELECT button on the dynamic field that you want to copy.

   A new (second) bounding box appears at the cursor, and the appropriate DFD description panels appear (if you have selected the production editing mode, see page ***6-5*** for information about how these panels are displayed).

3. Move the cursor and the attached bounding box to the location desired for the new dynamic field.

   If the bounding box does not move with the cursor, repeat step 2.

4. When the bounding box reaches the desired location, click again.

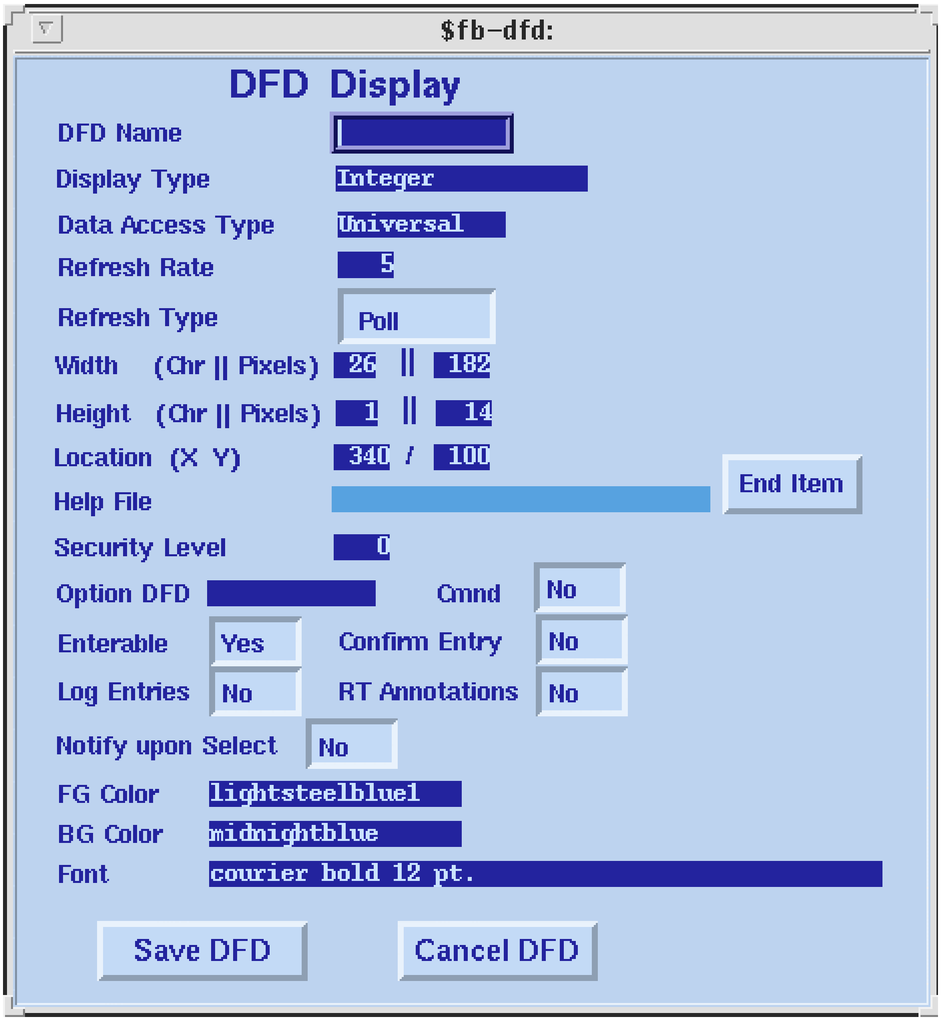
   The bounding box should remain fixed at the desired location.

If you are in *Production Editing Mode*, (see ***Setting operational preferences*** section in this chapter), you must click *Save DFD* to save the newly created DFD.

You can copy fields by repeating steps 2, 3, and 4, or you can end the copy function by selecting another editing function.

Entering dynamic field entries

You can describe or modify the size, position, color, and other attributes of a dynamic field by using the *DFD Display* panel shown here. This panel appears when you use any of the three methods for creating a DFD and have set the *Editing Mode* to *Production* on the *System Preferences* panel, as explained earlier in this chapter.



DFD Name
Display Type Integer
Data Access Type Universal
Refresh Rate 5
Refresh Type Poll
Width (Chr || Pixels) 26 || 182
Height (Chr || Pixels) 1 || 14
Location (X Y) 340 / 100
Help File
Security Level 0
Option DFD Cmnd No
Enterable Yes Confirm Entry No
Log Entries No RT Annotations No
Notify upon Select No
FG Color lightsteelblue1
BG Color midnightblue
Font courier bold 12 pt.

When the *DFD Display* panel first appears, most fields may already contain default values; this depends on the method you have used to create the DFD. You can change any of these by clicking on the field and using the editing keys described in ***Chapter 2***. Press the RETURN key when you have finished.

You can select many of these entries from pop-up option lists by moving the cursor into the box beside the entry name and clicking the mouse OPTION button, then moving the cursor to the selection that you want and clicking the mouse SELECT button. More information on specific entries is provided after the *DFD Display Entries* table.

DFD Display Entries

Entry Option **Description**

DFD Name

Enter a name for the dynamic field. You must include this name in cases where other dynamic fields (such as an *Equation*) refer to this dynamic field. If the dynamic field is a *Menu* display type, the *DFD Name* must be `$MAINMENU` to produce a pop-up menu or `$MAINPANEL` to produce a menu bar.

NOTE: Providing a unique DFD name for each dynamic field is highly desirable, and may speed data-server integration.

NOTE: Be sure the entries that you select for the display type and data access type are compatible, as explained in the ***Defining the display type and data access type*** section in this chapter.

Display Type

Select a display type for this dynamic field from a pop-up option list by clicking the mouse OPTION button on this field. Then click the mouse SELECT button on your choice.

Data Access Type

Select a data access type for this dynamic field from a pop-up option list by clicking the mouse OPTION button on this field. Then click the mouse SELECT button on your choice.

Refresh Rate

Enter an integer for the refresh rate.

Refresh Type

Select the refresh type by clicking on the box beside this label to toggle between *poll* and *stream.*

Width/Height/Location

Enter integers for the size and location of the dynamic field. *Width* and *Height* indicate the actual size of the dynamic field in characters (or pixels). *Location* indicates the horizontal and vertical offset from the top left corner of the format, in pixels. You can enter the *Width* and *Height* here, or set these fields by sizing the dynamic field in the *Drawing Area*. *Location* may be set by the position in the *Drawing Area*, or by entering the pixel coordinates.

DFD Display Entries (continued)

Entry Option **Description**

Help File

Use the *End Item* button if you want to attach help. The field is read-only.

Security Level

Enter an integer for the security level code for this dynamic field (see ***Chapter 4 Restricting access (security)***).

Option DFD

Enter the DFD name associated with this dynamic field, if any (see ***Chapter 7 Option List***).

Cmnd

Click the mouse SELECT button to toggle between:

Yes for option type (option sent to server).
No for standard type (option entered in dynamic field).

Enterable/Log Entries/
Confirm Entry

These entries apply only to dynamic fields where the user can enter data directly into the field (Real, Time, Integer, or Text). Toggle between Yes and No to indicate whether or not (1) data should be enterable, (2) entries should be logged, (3) entries should be confirmed. See ***Chapter 7 Sammi user entry***.

RT Annotations

This entry applies only to dynamic fields where runtime annotations are desired. See ***Chapter 7 Runtime annotations*** for details. Click the mouse SELECT button to toggle between:

Yes to add runtime annotations.
No to omit runtime annotations.

NOTE: The *RT Annotations* field has no effect on runtime annotations for the *Plot* and *Trend* display types. To cause blinking and color changing for these display types, you must set the *Data Quality* field to *Yes* on their respective display panels (see ***Chapter 7***).

DFD Display Entries (continued)

Entry Option	Description
Notify upon Select	If this field is set to *Yes*, a DFD with *Data Access Type* set to *universal* sends any mouse event that occurs within this DFD's boundaries to the server to which the DFD is connected. Information sent includes location and mouse button selected as well as any modifier key (SHIFT, CTRL, ALT) that was pressed.

NOTE: Notification occurs only if the DFD does not "trap" the mouse selection. All Motif widget-based DFDs trap the mouse selection. These DFDs are Curve Sets, the General Action Buttons and Groups, Graphs, Graphic Data Field, Menus, Option Lists, Push buttons (except transparent), Scrollbars, Selection Lists, Slider Bars, and Text Browser.

FG Color	Select the foreground color for this dynamic field from a pop-up option list when you click the mouse OPTION button in the box to the right of this entry. Then click the mouse SELECT button on your choice.
BG Color	Select the background color for this dynamic field from a pop-up option list when you click the mouse OPTION button in the box to the right of this entry. Then click the mouse SELECT button on your choice.

NOTE: Be sure not to make the foreground and background the same color, unless you want "invisible" characters (for example, when creating a dynamic field for entering passwords, you may want the user's entries to remain invisible for confidentiality).

Font	Select the font for any text (labels or data) in the dynamic field from a pop-up option list by clicking the mouse OPTION button in the box to the right of this entry. Then click the mouse SELECT button on your choice.

NOTE: Vector fonts may only be used in the font field in the DFD Display panel.

Defining the display type and data access type

Every dynamic field has a *display type* associated with it that controls how the field will look and act in the Runtime Environment. For example, the *Meter Display* type causes a dynamic field to look like a meter, with a dial that reflects incoming data values. Any dynamic field that receives data from other sources must also have a *data access type* that indicates the source of the data. The three primary data access types are:

- **Universal.** Dynamic field is linked to remote sources via an application.
- **Local.** Dynamic field receives data from other dynamic fields on the same format, files, etc.
- **Time**. Dynamic field receives time value from system clock (used for *Custom Time* display type only).

For specific details, please refer to ***Chapter 8***. Both display and data access types are entered on the *DFD Display* panel, as described earlier. Valid combinations of display types and data access types are shown in the following table.

Not all display types and data access types are compatible, and that some display types such as *Option List* do not access data since they are designed to receive input from other sources.

Display Types and Compatible Data Access Types

	Universal	*Local*	*NOP*	*Time*	*Curve Set*
Alarm	X	—	—	—	—
Bar	X	—	—	—	—
Barchart	X	—	—	—	—
Curve Sets	—	—	—	—	X
Custom Time	X	—	—	X	—
Dynamic Object	X	—	—	—	—
Equation	—	X	X	—	—
Formatted Numeric	X	—	—	—	—
Gauges	X	—	—	—	—
General Action Button	X	—	X	—	—
Button Group	—	—	X	—	—
Graphic Data Field	X	X	—	—	—
Integer	X	X	—	—	—
Menu	X	X	—	—	—
Meters	X	—	—	—	—
Meters, Fixed-Scale*	X	—	—	—	—
Meters, Moving-Scale*	X	—	—	—	—
Object Icon	X	X	—	—	—
Options	—	—	—	—	—
Pie Charts	X	X	—	—	—
Plot	X	—	—	—	—
Real	X	X	—	—	—
Region	X	X	—	—	—
Scroll Bar	X	X	—	—	—
Selection List	X	X	—	—	—
Slider	X	—	—	—	—
Symbol Table	X	—	—	—	—
Text	X	X	—	—	—

	Universal	Local	NOP	Time	Curve Set
Text Browser	X	X	—	—	—
Text Table	X	—	—	—	—
Trend	X	—	—	—	—

*Linear

** If you set the *General Action Button Data Access Type* to *NOP*, you should set the *Refresh Rate* to 0 (zero) and the *Poll Type* to *Stream*. This reduces the load on the Runtime Environment and enhances overall performance.

Specifying refresh rate and type

For each dynamic field that accepts data from applications, you must specify a *refresh rate* and a *refresh type.* The refresh rate controls *how often* data will be supplied to the dynamic field, and the refresh type controls *how* data will be supplied.

The refresh rate is expressed as a whole number (integer) with units that may vary, depending on the refresh type. The two major types of data refresh are discussed below:

- **Poll method.** This method is used with API applications based on the *client-server* model. The dynamic field is updated at regular intervals by *Sammi* at the selected refresh rate. The refresh rate for this method is always calibrated in seconds and the minimum rate is 1 (one second).
- **Stream method**. This method is used with API applications based on the *peer-to-peer* model. The dynamic field is updated by the API. The refresh rate for this type may be interpreted and used by the application, if desired.

If you do not know which method to use, ask your API programmer or system administrator for help.

Defining size and position

If you have planned correctly (see ***Chapter 2 Planning the interface***), you should already know the exact size and position of each dynamic field you want in the format. Each of the DFDs you add to a format will appear in the final *Sammi* window in the exact size and position that you specify here.

Define the size of a DFD one of two ways:

- Enter the dimensions in the *Width* and *Height* fields of the *DFD Display* panel. On this panel, the values to the left of the two lines (||) are measured in characters, and the values to the right are in pixels. When entering values in the *Width* and *Height* fields, enter the size in either characters or pixels, not both, as the Format Editor calculates the adjoining field. (See ***Appendix E*** for an explanation of pixel measurements.)
- Click the mouse SELECT button in the *Drawing Area* at a point for the upper left corner of the DFD, then, using the mouse, move the cursor down and to the right to define an area in the *Drawing Area*.

Location can only be set by initially clicking the mouse SELECT button in the *Drawing Area* to specify the upper left corner for the DFD. For *Location*, both values are measured in pixels, with the two values indicating horizontal and vertical offset (respectively) from the top left corner of the format. The location field of the DFD display panel may be modified to adjust the upper left corner of the DFD.

Sizing a new dynamic field

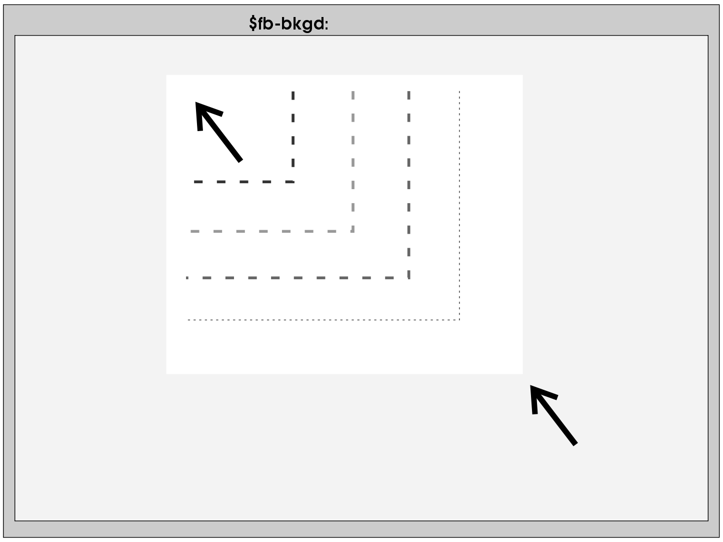
An easy way to indicate size is to draw an outline of the dynamic field inside the *Drawing Area*. For new dynamic fields, follow these steps:

1. Select the *Add DFD* option from the *Dynamic Fields* menu of the *Format Editor Control* panel.

2. Move the cursor to the upper left corner of the area where you want the dynamic field to be located, and click the mouse SELECT button once. Notice that *Location* is now fixed.

3. Move the cursor until the dynamic field outline is the desired size, or until the desired Width/Height settings appear (see discussion below). Note that the *Width/ Height* settings change as you move the cursor.

4. Click the mouse SELECT button again.



Sizing a Dynamic Field

You can repeat these steps as often as necessary to get the desired results. For both *Width* and *Height*, the pixel dimensions may be ignored, since they are calculated as you stretch the dynamic field outline. However, character dimensions are crucial for those display types that show alphanumeric data:

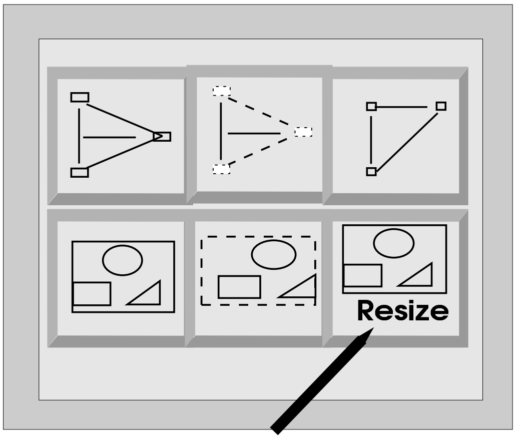
Alarm
Custom Time
Equation
Formatted Numeric
Integer
Real
Selection List
Text
Text Browser
Text Table
Time

For these display types, the width in characters should reflect the largest possible data value (i.e., maximum number of characters likely to be displayed in the dynamic field). The height should equal the total rows of data you intend to display. The *Width* and *Height* in characters depends on the pixel dimensions and font selected.

Resizing dynamic fields

With the *Resize Tool*, you can resize any dynamic field to any proportion. To resize a dynamic field:

1. Click the mouse SELECT button on the *Resize Tool* button on the *Format Editor Control* panel.



Resize Tool

2. Move the cursor to the *Drawing Area*. The cursor changes to a hand with a pointing finger, and the dynamic fields become transparent areas with double outlines.

3. Point to the DFD that you want to resize and click the mouse SELECT button. The DFD becomes a solid area with "handles" (small boxes) on each corner.

   — To resize in one direction, click the mouse SELECT button on a side (top, bottom, left, right) of the outline. The cursor changes to a cross, and a rubber band box with three sides anchored appears.

   — To resize a dynamic field in two directions, click the mouse SELECT button on one of the handles. The cursor changes to a cross and a rubber band box appears anchored on the diagonally opposite corner.

4. Use the rubber band box to assist you in sizing the dynamic field; when you have the desired size, click the mouse SELECT button again.

   — To shrink a rubber band box, move the cursor toward the center of the box.

   — To expand the rubber band box, move the cursor away from the center of the box.

NOTE: If the *DFD Display* panel is on your screen, notice that the *Width* and *Height* fields change as you resize the dynamic field.

5. To save the new DFD size, click the mouse SELECT button on the *Save DFD* button of the *DFD Display* panel.

NOTE: The *DFD Display* panel does not display if you have selected the *Design Editing Mode* on the *System Preferences* panel, and the above step is unnecessary.

If you are dissatisfied with the results, use the *Undo* function immediately to reverse the operation.

Creating on-line help

You can provide *Sammi* users with on-line help by connecting a plain ASCII-text *help file* to the dynamic field. The Format Editor lets you create one help file per dynamic field. Whenever help is needed, the *Sammi* user can hold down the SHIFT key and click the mouse OPTION button to pop up a window containing the help information.

The Format Editor allows you to create one general help file per format and an additional help file for each dynamic field.

Selecting a security level (restricting access)

You can restrict access to individual dynamic fields to authorized users only much in the same way you restrict access to the whole format. This is done by entering the appropriate *Security Level* code in the *DFD Display* panel.

Security levels are defined by the *Sammi* system administrator using procedures described in the ***System Administrator's Guide***. If you do not know the correct security level codes, ask your system administrator. Entering a value of 0 in this field allows any *Sammi* user to add, change, delete or copy your DFDs.

DFD libraries

You can create a dynamic field and save it independent of a format as a *DFD Library* file. This feature allows you to create a dynamic field template with specific color(s), size, font usage, etc. You can then use this dynamic field in other formats repeatedly.

DFD Library files are stored on the disk and retrieved into any format currently being edited with the **read-dfd-lib** command. The *Display Palette* on the *Dynamic Fields* menu uses libraries in exactly this way. Or you may view and select from a list of libraries with the *Read DFD Lib* panel, available by selecting the *Read DFD Lib* option from the *Dynamic Fields* menu of the *Format Editor Control* panel.

For example, applications built by your organization might require the use of three different “standard” meters, any or all of which could appear on a format. You can create each of these meters separately on an “empty” (new) format and save it with the **save-dfd-lib** command under a distinct name (`meter1, meter2`, and so on). Now, instead of creating the DFD each time you want to use it, you can simply read it into a format with the **read-dfd-lib** command.

The following sections describe how to work with DFD Libraries.

Creating DFD libraries

To create a *DFD Library* file and save it to disk:

1. Edit an existing dynamic field or add a new dynamic field within the format as described in the earlier sections of this chapter.

2. Modify the attributes of the dynamic field to your desired specifications. Make sure that all panels are saved by pressing the RETURN key in an input field or by clicking on the *Save DFD* button (where available).

3. Once you have modified the attributes, and with the dynamic field still selected (it should be highlighted), select the *Save DFD Lib* option from the *Dynamic Fields* menu of the *Format Editor Control* panel. The menu disappears, and the *Save_Lib_popup* appears.

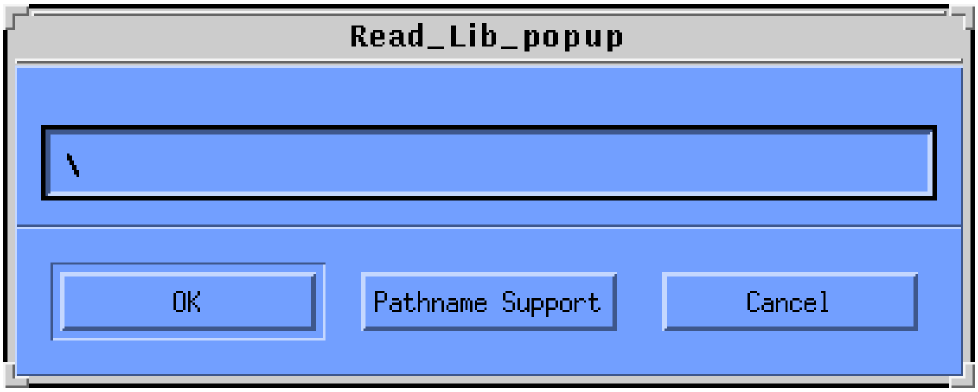
4. Complete the Pathname and press OK.

Using the DFD library

Once a dynamic field is saved in the MDB (FWDU_LIBRARY_BINARY end item), you can read that library into any synoptic display with the Read DFD Lib option To do this:

1. From the *Dynamic Fields* menu, select the *Read DFD Lib* option.

The menu disappears and the following window appears:



2. Complete the Pathname by typing or using Pathname Support and press OK. The End Item must be a FWDU_LIBRARY_BINARY.

3. Move your cursor into the *Drawing Area*.

   As the *DFD Display* and other dynamic field attribute panels are displayed, a bounding box appears at the cursor location.

4. Using the mouse, move the box to the desired location and click the mouse SELECT button again.

   The *DFD Library* file has been added to the format.

NOTE: If you are in the *Production Editing Mode*, the newly added DFD Library will be selected for editing. You may edit the dynamic field attributes or save the DFD as added. If you are in the *Design Editing Mode*, none of the DFD attribute panels will appear when the DFD is placed in the format— it is saved.

5. To continue adding the same *DFD Library* file in different locations on the same format, click the mouse SELECT button and the bounding box reappears.
   Repeat step 5.

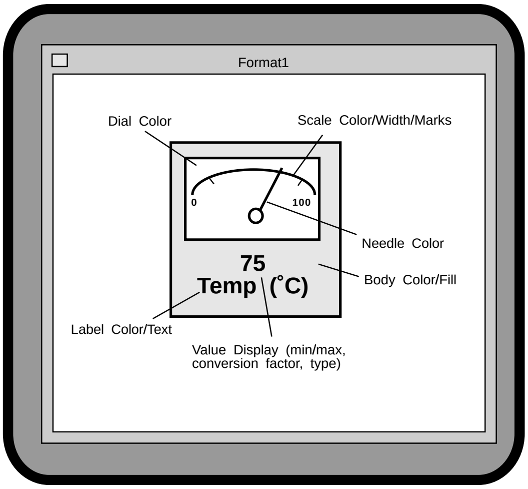
Deleting DFD libraries

To delete a *DFD Library* use the I_MDB.

CHAPTER 6-182 Dynamic Field Description

General features

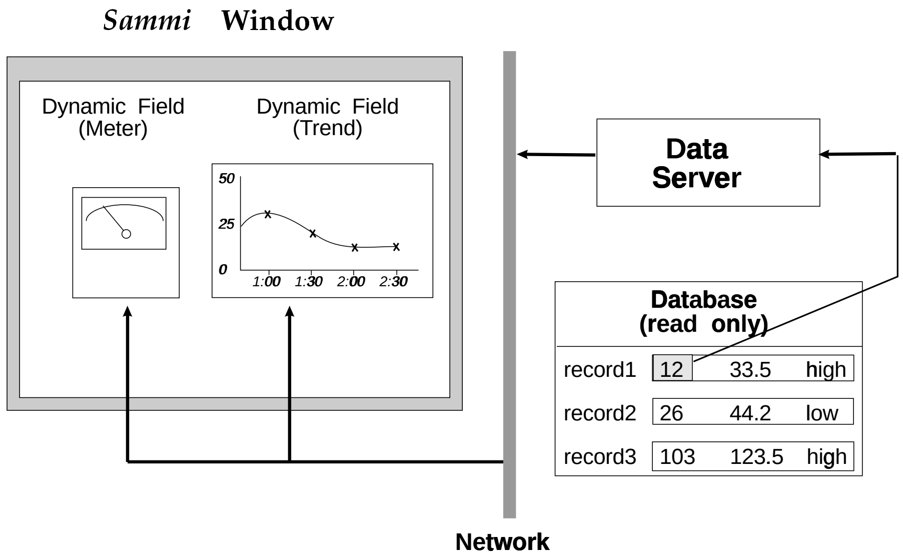
As part of the dynamic field description entered on the *DFD Display* panel in the previous chapter, you selected a *display type* that controls how the dynamic field looks and works in *Sammi*. This chapter provides more detail on the function of each display type and how to enter specifications for it (like the *Meter* shown in the illustration below).



Typical Display Type

Some display types, like *Bar*, *Barchart*, *Linear Meters*, *Meter*, and *Gauge*, use the last value received to set the current position of an indicator on a scale. Except for the *Moving-Scale Linear Meter*, these display types can also optionally show the highest and lowest values the data has displayed since the last initialization process. For a *Plot* or *Trend* display type, the range of values is plotted as a continuous graph.

The diagram below shows how these display types function.

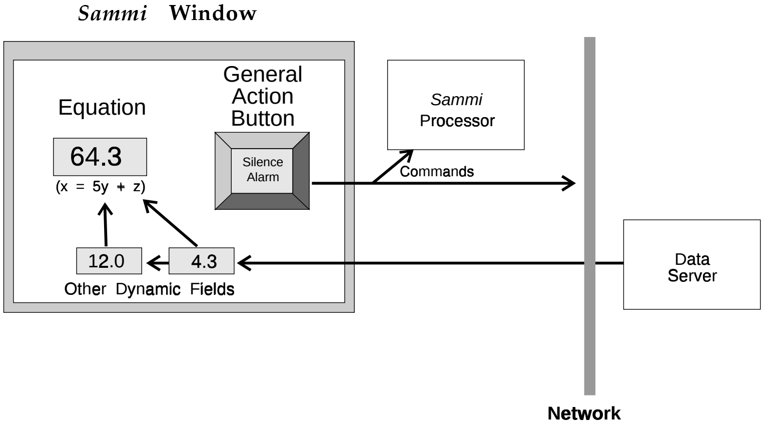


record1	12	33.5	high
record2	26	44.2	low
record3	103	123.5	high

Display Type Functions

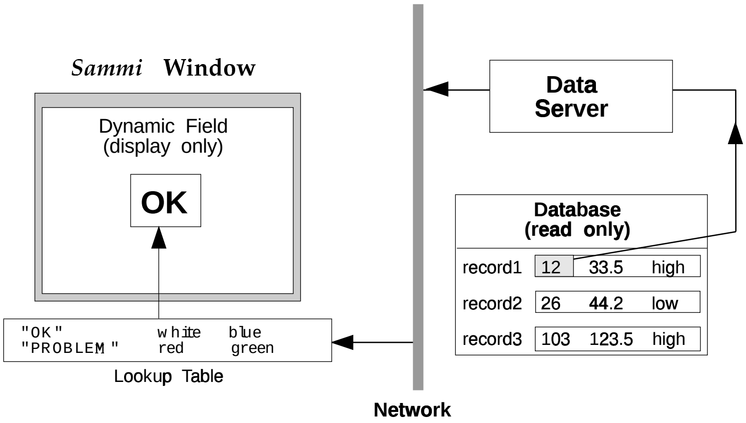
With other display types like *Equation*, *General Action Button*, *Menu*, *Option* and *Selection Lists*, *Scrollbar*, *Slider*, and *Text Browser*, the *Sammi* user can send commands or data strings, or view and edit files.

The following diagram shows two different display types, *Equation* and *General Action Button*, inside a *Sammi* window. Notice that neither of these display types receives data directly from a data server. *Equation* pulls data values from two other dynamic fields, calculates a value using a pre-defined algorithm, then displays the result. A *General Action Button* sends commands to the *Sammi* processor or to the network whenever the user clicks on that button with the mouse SELECT button.



Equation and General Action Button Functions

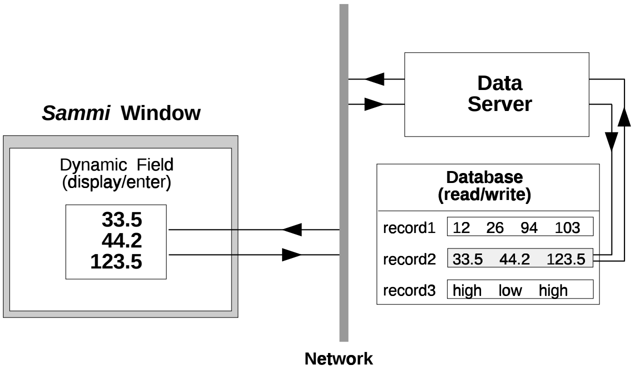
Other display types like *Alarm*, *Dynamic Object*, *Formatted Numeric*, *Object Icon*, *Text Table*, and *Symbol Table*, use a *lookup table* like the one shown below. *Sammi* compares incoming data to the lookup table, then selects the appropriate display qualities. The lookup table can set foreground and background colors and other attributes used for displaying the dynamic field.



Lookup Tables

With other display types, like *Real*, *Integer*, *Text*, and *Custom Time*, data values are displayed literally or can be entered or changed directly by the *Sammi* user.

The diagram below shows the function of this type of display:



Input/Output Display Type Function

A display type can have several optional features, including:

- **Multiple values**. Some display types can show a single value or a series of values.
- **User entry.** Some display types, referred to as enterable, allow the *Sammi* user to change the current value(s) by entering new data; these changes are written back to the source. You can set whether a display type is view-only or view and change.
- **Runtime annotations.** Some display types use a *quality word* that, when received from a data source, makes them blink, change color, and/or have a two-character description code appended.
- **Runtime keys.** You can set data source information as a generic variable, then allow the user to substitute a specific value during runtime.

For more details on each of these features, refer to the following sections.

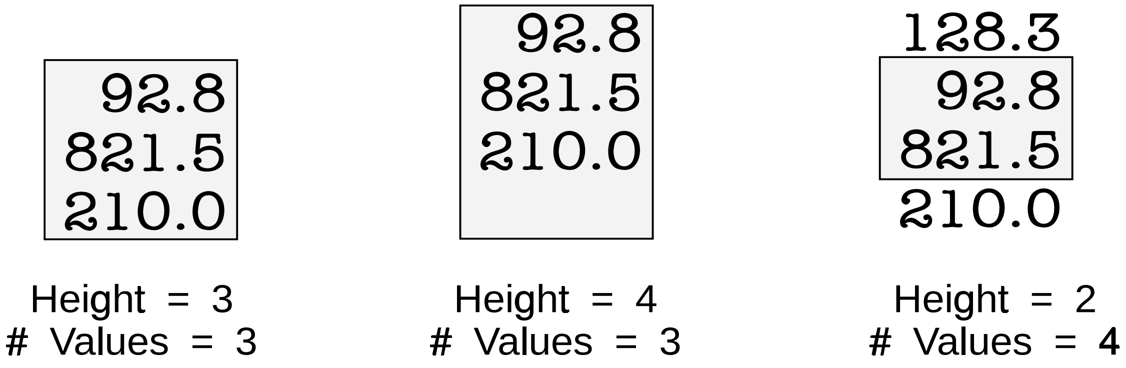
Multiple values

This feature is controlled by the height of the dynamic field (in characters) that you enter in the *DFD Display* panel (see ***Chapter 6***) and by the *Number of Values* that you specify in the *Data Access Description* panel (see ***Chapter 8***). The relationship between these two values controls how the data is displayed, as explained below:

- If the field height (in characters) and the number of values are equal, the values exactly fill the field from top to bottom; that is, all values display simultaneously.
- If the field height is greater than the number of values, the values do not fill the field; that is, there is blank space after the last value.

- If the field height is less than the number of values, the user cannot see all the values, resulting in incomplete information. Avoid this situation, unless you add scroll bars.

The illustration below demonstrates this; the gray area represents the display area:



Comparing Field Height with Number of Values

Thus, when creating data display types you should always keep in mind the number of values to be displayed and the height required to display them. If there is not enough room in the format to display all of them, you are needlessly transferring data values that the user cannot see.

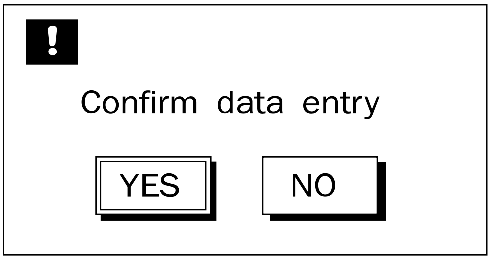
Sammi user entry

Set whether an enterable display type is view-only or view and change by toggling *Yes* next to *Enterable* on the *DFD Display* panel. This feature enables the *Sammi* user to type data directly into the dynamic field; the entry can be written back to the data source if this feature is supported by the data server and the data access description discussed in ***Chapter 8***.

For enterable dynamic fields, other features may also apply:

- **Entry confirmation.** This feature displays a dialog box (illustrated below), asking the user to okay the data changed in the dynamic field. The user must click *Yes* or press the Return key to confirm; the data entry is then accepted and the dialog box disappears.

Set this feature by toggling the *Confirm Entry* box on the *DFD Display* panel to *Yes*.



Confirm data entry

You can also change a DFD's enterable attribute during runtime using the **change-dfd-attribute** command. Please refer to the ***Command Reference*** for more information.

- **Event logging.** You can track user entries by having these entries appear as *system events* in *Sammi* alarm displays (if your *Sammi* system supports the optional alarm subsystem). Set this feature by toggling the *Log Entries* box on the *DFD Display* panel to *Yes*. When this feature is enabled, the following message is added to the *Sammi* alarm display(s) each time the user makes an entry; it shows the time, date, userid, old value, and new value entered:

```
(time) (date) OPENTRY FROM (userid) OLD = xxx NEW = xxx
```

- **Maximum/minimum limits.** You can set limits on the value entered by the *Sammi* user, restricting the value to a certain range. Set this feature by entering values in the *Maximum/Minimum Limits* fields on the specific display type panel. When a user enters a value outside these limits, an error message displays.

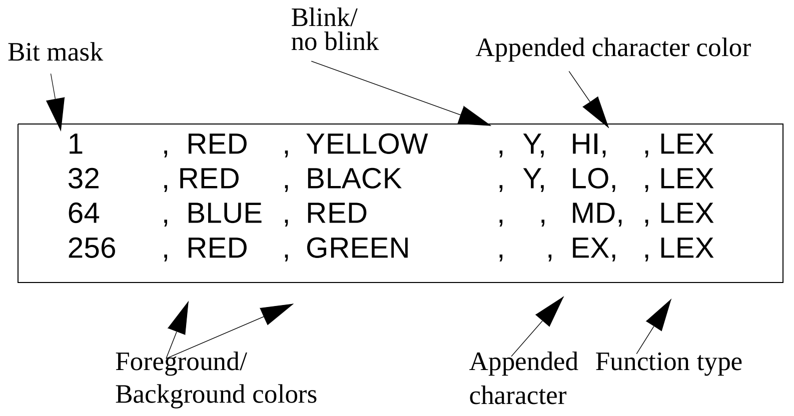
Runtime annotations

You can use runtime annotations when you want a dynamic field to blink, change color, and/or show a two-character appended text code (such as LO or HI). To use this feature, each incoming data value must be accompanied by a *quality word*, a 32-bit unsigned integer with bits specifically set to indicate data quality. This quality word must be provided by an application.

NOTE: On the *Bar, Barchart, Piechart* and *Linear Meter* display types, runtime annotation is limited to changing the color of the bar or pie unless they have their *Show Value* field set to *Yes*.

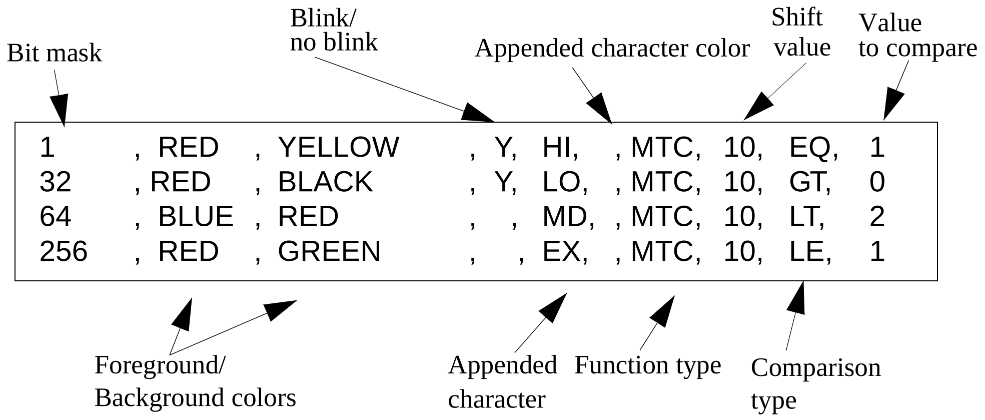
To use runtime annotations, create a lookup table as shown below. Then, set this feature by toggling the *RT Annotations* box on the *DFD Display* panel to *Yes*. When you select this option, the application notifies the Runtime Environment that your dynamic field expects a quality word with the data value from the lookup table. Create (or edit) the lookup table using any ASCII text editor. Save the table under the filename `rtda.dat` in the `$SAMMI/data` directory.

All dynamic fields using runtime annotations share the same table to make the runtime effects consistent throughout the user interface.



```
1      , RED   , YELLOW     , Y,  HI,   , LEX
32     , RED   , BLACK      , Y,  LO,   , LEX
64     , BLUE  , RED        ,  ,  MD,   , LEX
256    , RED   , GREEN      ,  ,  EX,   , LEX
```

Table Format for Single-bit Setting



```
1      , RED   , YELLOW     , Y,  HI,   , MTC,  10,  EQ,  1
32     , RED   , BLACK      , Y,  LO,   , MTC,  10,  GT,  0
64     , BLUE  , RED        ,  ,  MD,   , MTC,  10,  LT,  2
256    , RED   , GREEN      ,  ,  EX,   , MTC,  10,  LE,  1
```

Table Format for Multiple-bit Setting

NOTE: If you leave the blink/no blink entry blank, no blink is used.

There are three types of entries: LEX, MTC, and Index Comparison. LEX is used when each bit of the quality word flags a distinct quality value. MTC is used when multiple bits of the quality word can be combined to flag a quality. Index comparison is used with masks for each runtime attribute (such as foreground and background colors).

Each row in the lookup table shows special effects to be applied to the dynamic field when a specific bit (or group of bits) is set in the quality word. The rows are listed in order of priority. As soon as *Sammi* encounters a match, it uses the settings for that row.

For matching LEX entries, the bit mask is ANDed with the quality word. If the result is NOT ZERO, a match has been found. For matching MTC entries, the quality word is ANDed with the bit mask, then shifted and the result compared to the value in the entry using the comparison type operation in the entry. If the result is TRUE, a match has been found. For matching Index Comparison entries, the bit mask for each attribute is ANDed with the quality word.

Each row of the table must follow the appropriate format shown on the previous page. In each row, the first value is the bit setting to be compared to the quality word. Colors, blink and appended characters are included only if they apply to a given bit setting; otherwise, they are left blank.

If the quality word has only one bit set, LEX is used as the seventh and last entry in each row. If multiple bits are set, MTC is used as the seventh entry and is followed by a shift value, a comparison operator (EQ, NE, GT, LT, or LE), and a value against which to compare. For an explanation of masking and shifting, see ***Appendix G***.

For index comparison, masks (expressed in hexadecimal notion) can be applied for each attribute:

1. foreground color (fg_color)
2. background color (bg_color)
3. character foreground color (char_fg_color; used by both characters)
4. character background color (char_bg_color; used by both characters)
5. character 1 (char_1; first appended character)
6. character 2 (char_2; second appended character)
7. blink/no blink (whether the DFD blinks or not)

The `rtda.dat` file is set up with 10 fields per record. Fields 1-10 are required for the MTC method; LEX uses fields 1-7. Although index-comparison uses only fields 2, 3, and 5, each of the ten fields must contain a place value (a blank is acceptable), because all three runtime annotation methods expect to find these fields. You will probably find it helpful to assign sequential integers, beginning with 0, in field 1, so as to keep track of from which record a specific attribute is taking its value. Commas are used as field delimiters; tabs cannot be used to space fields in columns.

Please refer to ***Appendix D*** for more details and sample `rtda.dat` files.

Runtime keys

Runtime keys function as generic variables representing all or part of any data source parameters, for which a user can later substitute specific values. Runtime keys are useful if you do not know the specific variable when creating a format, or when required to link multiple versions of the same format to different data sources.

For example, the necessary applications that will provide data to the formats you are designing may not be complete until after the user interface is completed.

Or, you may want to create one format but duplicate and link it with a variety of data sources.

You can specify runtime keys in fields like the *Read key* and Logical Server of the *Data Access Description* panel, preceding the desired key with an @ symbol. For example, type:

@test1

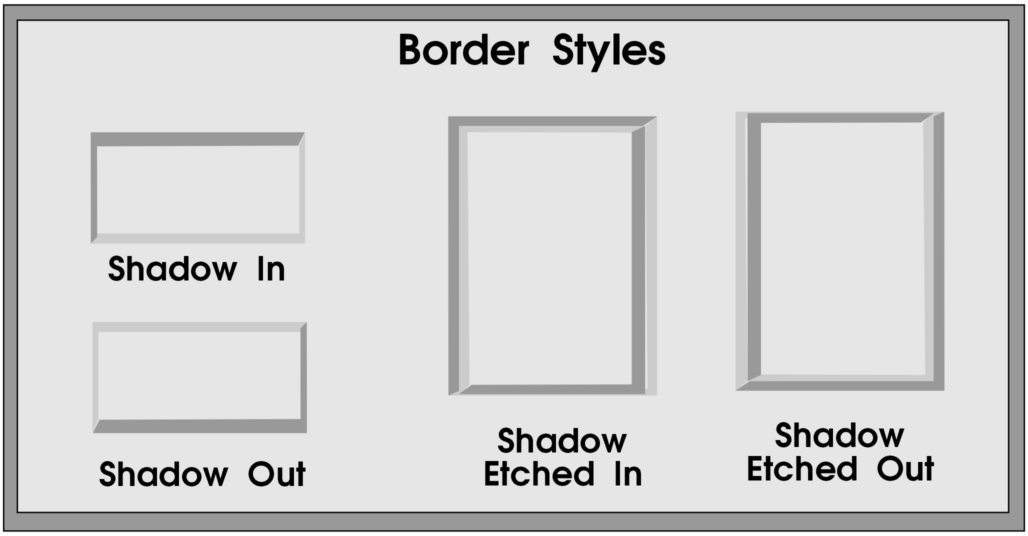
in the Read key field to set a generic data source parameter. During runtime, a user can then define @test1 to equal a specific text string (value) using a special format (called $session) or a *Sammi* command (**set-runtime-key**).

Runtime keys can be grouped into sessions. A session can then be assigned to one or more formats. Multiple sessions can be created, but only one can be attached to a format at a time. The user can swap out one session for another during runtime.

Please refer to ***Chapter 8 Data Access Types*** for more information on runtime keys.

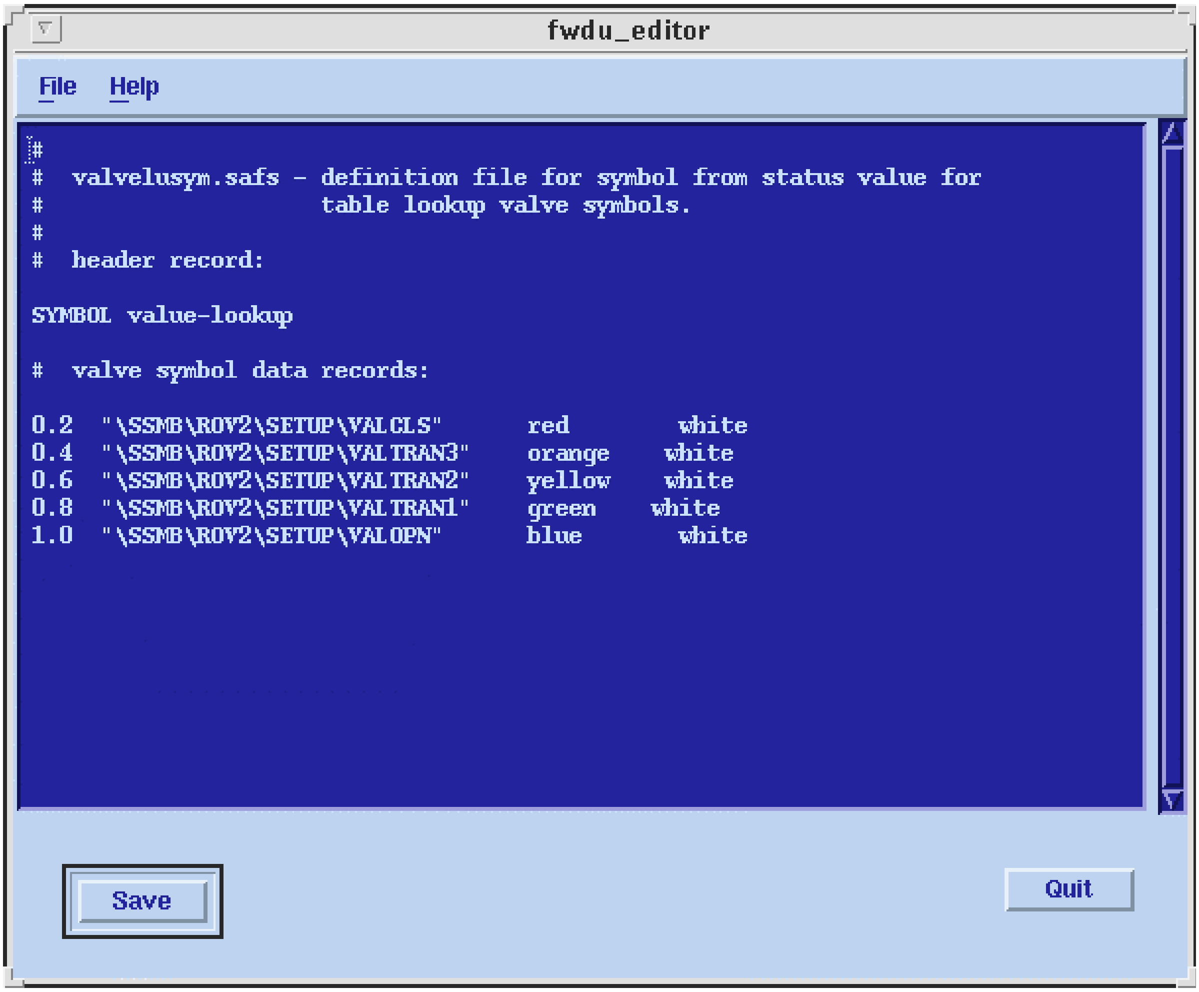
Border styles

When you create most dynamic fields, you have the option of adding a border by creating a border width greater than zero. You can select one of the four possible appearances:



Lookup tables and indexing

For the symbol table and text table display types you must attach a FWDU_SYMBOL_TABLE_TEXT End Item. The fwdu_editor appears if you invoke a FWDU_SYMBOL_TABLE_TEXT:



```
#
#   valvelusym.safs - definition file for symbol from status value for
#                     table lookup valve symbols.
#
#   header record:

SYMBOL value-lookup

#   valve symbol data records:

0.2  "\SSMB\ROV2\SETUP\VALCLS"      red        white
0.4  "\SSMB\ROV2\SETUP\VALTRAN3"    orange    white
0.6  "\SSMB\ROV2\SETUP\VALTRAN2"    yellow    white
0.8  "\SSMB\ROV2\SETUP\VALTRAN1"    green    white
1.0  "\SSMB\ROV2\SETUP\VALOPN"      blue       white
```

The fwdu_editor checks that the entered Pathnames are valid.

Sammi checks which symbol to display by comparing the incoming data value to the lookup table. The incoming data value can be a short integer, a long integer, a single-precision floating point value, or a double-precision floating point value.

The examples below show two different formats that you can use to create the lookup table:

Value-Lookup Method:

```
SYMBOL value-lookup
0.0    “valcls”      red        white   blink
0.25   “valtran3"    orange     white
0.50   “valtran2"    magenta    white
0.75   “valtran1"    magenta    lightgray
1.00   “valopn”      navyblue   aquamarine
```

Index-Lookup Method:

```
SYMBOL index-lookup
“valcls”      red        white
“valtran3"    orange     white
”valtran2"    magenta    white         blink
“valtran1"    magenta    lightgray
”valopn"      navyblue   aquamarine
```

Notice that both examples have a title line indicating the lookup method being used (value-lookup or index-lookup). The title line is followed by the names of symbol bitmap files to be used (in quotation marks) and the corresponding foreground/background colors to be used with each. Enable the blinking feature on any symbol by adding the word “blink.” The value-lookup method includes numeric values as the first entry in each row of the table, whereas the index-lookup method does not.

This difference is explained below:

- **Value-lookup method.** In this method, the incoming data value is converted to a double-precision floating point number, then compared to the first entry in each row of the lookup table, starting with the top row. If the entry is less than or equal to the incoming data value, *Sammi* uses the symbol, colors, and blink attribute listed in that row.

  For instance, in the earlier example, an incoming data value of 0.35 will cause *Sammi* to use the “valtran3" symbol file with orange foreground, white background, and no blink. This is because 0.25 <= 0.35 < 0.5. If the incoming data value is less than the value of the first symbol in the table, the first symbol will be selected; if the value is greater than the value of the last symbol in the table, the last symbol will be selected.

  This is a more straightforward method than the index-lookup, and works for any range of incoming data values — as long as your table entries reflect the entire range. In order for this method to work correctly, the lookup table must be arranged so that the values associated with symbols increase from the first row to the last row.

- **Index-lookup method**. In this method, *Sammi* knows which row of the lookup table to use by converting the incoming data value to a row number. For example, if the converted value is 7, the eighth row of the lookup table is used (row numbering starts with 0). The conversion process used to calculate this row number is more likely to be used by experienced programmers. The conversion process and the two methods used for looking up the row number are described below.

Value conversion. The incoming data value is first converted to an unsigned long integer. The value is then shifted right by the specified number of shift bits (as specified in the *Symbol Table* display panel discussed later in this section). The right-shifted value is then bitwise ANDed with the specified mask (see ***Appendix G*** for a discussion of shifting and masking). If the mask value is 0, the raw data value will not be shifted or masked.

For example, if the *Symbol From Status display* type is created with a bit shift value of 0 (no shift) and a mask value of 7 (hexadecimal), and the incoming data value is 10.5, the value will be converted as follows:

Incoming data value	= 10.5
Converted to unsigned long integer	= 10
Shift zero bits	= 10
Bitwise ANDED with the mask value	= 2

NOTE: Keep in mind that 10 decimal is 1010 binary; 7 decimal is 0111 binary; 1010 bit ANDed with 0111 is 0010 binary, or 2 decimal.

If the incoming data value is a single- or double-precision floating point number, the floating point value is truncated (that is, the extra digits are discarded) when the value is converted to an unsigned long integer. For example, an incoming value of 2.987 is truncated to 2, not rounded to 3.

NOTE: If the floating point number is too large or too small to fit into an unsigned long integer, the value resulting from the conversion is incorrect.

Direct index. The final converted value can be used directly as the row number to be looked up in the table. Indexes are zero-based: if the converted value is 0, the first row is used; if it is 1, the second row is used; and so on. If the converted value is larger than the number of rows, no symbol is shown and an error symbol is displayed. In the index-lookup example shown earlier, the largest value that can be used for lookup is 4 (index to row 5).

Indirect index. Alternately, the final converted value can be used to look up a cell in an eight-celled array. Each cell contains a specific row number from the table. For example, the illustration below shows cells numbered 0 through 7 containing a random sequence of row numbers.

If the final converted data value is 3, the value from cell 3 (the fourth cell in the array) is found. This cell, in turn, contains the number 2, which points to row number 2 (the third row) in the lookup table.

```
cell number:    0  1  2  3  4  5  6  7
cell contents:  4  4  3  2  2  1  0  0
```

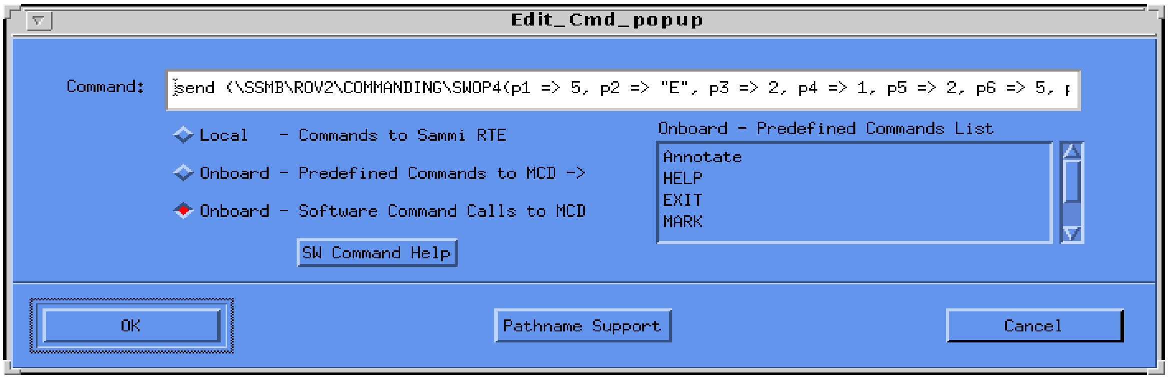
If the final converted data value is larger than 7, or if the contents of any index cell is larger than all the row numbers in the table, an error symbol is displayed.

The table can have any number of rows, but a maximum of eight symbols can be selected, since there are only eight cells. Thus, the indirect index is a useful way to select subsets of symbols from a larger table of lookup symbols.

Entering a Command

Several of the dynamic fields allow you to type in a command, for example the General Action Button(GAB). When the edit command button is pressed an Edit_Cmd_popup dialog appears. The name and position of the edit command button depends on the dynamic field. See the description of the individual dynamic field for a description of the location of the button(s).

The Edit_Cmd_popup looks as follows:



Edit_Cmd_popup

Command: send (\SSMB\ROV2\COMMANDING\SWOP4(p1 => 5, p2 => "E", p3 => 2, p4 => 1, p5 => 2, p6 => 5, p

○ Local - Commands to Sammi RTE

○ Onboard - Predefined Commands to MCD ->

● Onboard - Software Command Calls to MCD

Onboard - Predefined Commands List

Annotate
HELP
EXIT
MARK

It is possible to enter 3 types of commands:

- Sammi commands
- Onboard - Predefined Commands
- Onboard - Software Commands

First select the type of command you want by clicking on the type. Note that the red “radio button” gets selected.

NOTE: If the *Edit_Cmd_popup* seems to behave strange - e.g. pathnames are reported not to be found, syntax errors are reported that are not there, pre-defined commands can not be selected but a beep is heard instead - then make sure you have selected the correct type of command!

Sammi Commands

How enter the command that *Sammi* should send to the Sammi Runtime Environment. Only Sammi commands should be entered in this mode. References to other displays should be entered with their full MDB pathname. The complete list of commands can be found in the Command Reference.

After entering the command press the OK button. At this point the existence of found MDB pathnames is checked. Use preview to test the command.

Onboard - Predefined Commands

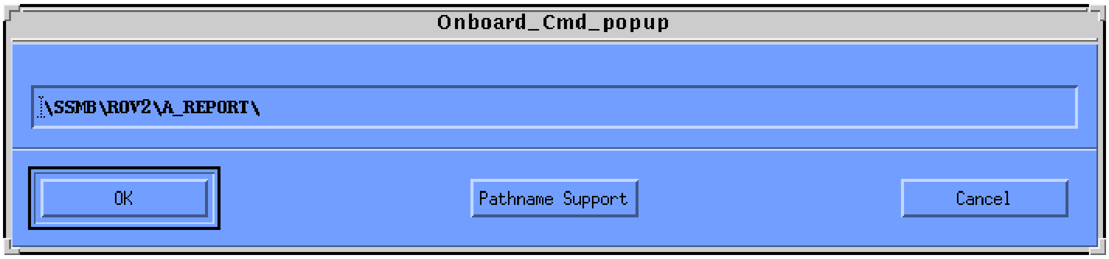
A predefined command is at runtime handled by the MCD. The list of valid commands is listed in the *Onboard - Predefined Commands List.* Press on the wanted command in the list. The command is automatically copied to the Command. You can also enter the command manually.

When the correct command has been selected then press OK. Only commands found in the list are allowed. The list is based on the commands entered in the Equipment Constraints. See the section about the FWDU Text Editor for information about how to enter and modify the list.

Onboard - Software Commands

Onboard Software Commands are also handled by the MCD at runtime.

In this mode you can get a template for a swop_command/ ucl_automated_procedure using the Onboard Command Help. After selecting *Onboard - Software Command* press on the *SW Onboard Help* button.   Pressing this button, the following window appears:

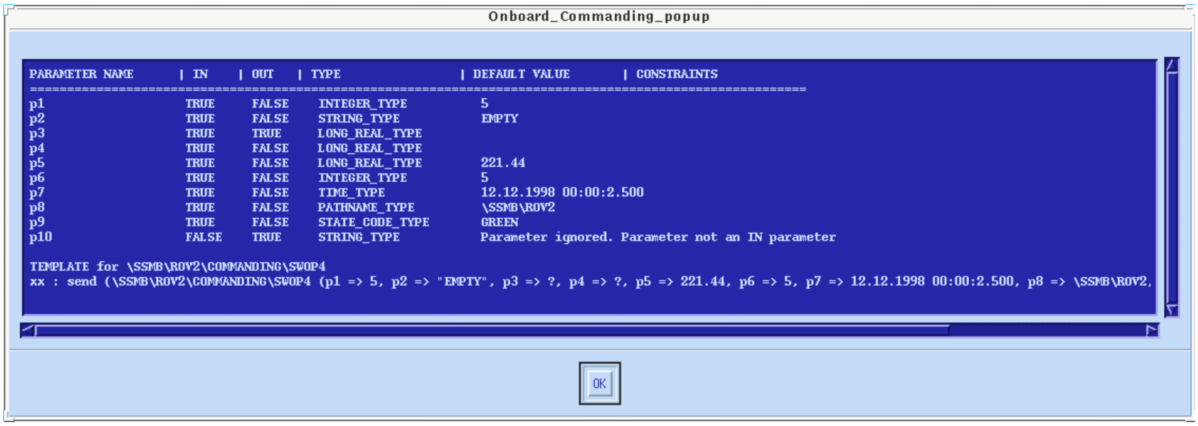


Onboard_Cmd_popup

\SSMB\ROV2\A_REPORT\

Enter a full MDB pathname for a *swop_command / ucl_automated_procedure* End Item type or use Pathname Support. When a correct pathname has been entered then press OK.

Now the following window appears:



```
PARAMETER NAME       | IN     | OUT    | TYPE                    | DEFAULT VALUE        | CONSTRAINTS
=====================================================================================================
p1                    TRUE     FALSE    INTEGER_TYPE             5
p2                    TRUE     FALSE    STRING_TYPE              EMPTY
p3                    TRUE     TRUE     LONG_REAL_TYPE
p4                    TRUE     FALSE    LONG_REAL_TYPE
p5                    TRUE     FALSE    LONG_REAL_TYPE           221.44
p6                    TRUE     FALSE    INTEGER_TYPE             5
p7                    TRUE     FALSE    TIME_TYPE                12.12.1998 00:00:2.500
p8                    TRUE     FALSE    PATHNAME_TYPE            \SSMB\ROV2
p9                    TRUE     FALSE    STATE_CODE_TYPE          GREEN
p10                   FALSE    TRUE     STRING_TYPE              Parameter ignored. Parameter not an IN parameter

TEMPLATE for \SSMB\ROV2\COMMANDING\SWOP4
xx : send (\SSMB\ROV2\COMMANDING\SWOP4 (p1 => 5, p2 => "EMPTY", p3 => ?, p4 => ?, p5 => 221.44, p6 => 5, p7 => 12.12.1998 00:00:2.500, p8 => \SSMB\ROV2,
```

For each found parameter the following is listed:

NAME, IN/OUT type, TYPE, DEFAULT VALUE and *CONSTRAINTS*

If we take a look at parameter P1 we see the parameter is an IN parameter of type INTEGER having the default value of 5. Non IN parameters are ignored (see P10 parameter). To help you in creation of a onboard command, the onboard command help provides you with a template with all default values put in (see last line in above figure).

Legal Onboard Command types:

STRING TYPE parameters are in enclosed by “”. (See P2 parameter).

TIME TYPE parameters have the format DD.MM.YYYY HH:MM:SEC.S1000 (S1000 = thousands of a sec). (See P7 parameter).

STATE CODE TYPE parameters are preceded by a $ (example “P9 => $GREEN”).

INTEGER TYPE parameters are scalars (See P1 parameter)

PATHNAME TYPE parameters are MDB pathnames (See P8 parameter).

REAL TYPE parameters are floats (See P5 parameter).

Parameters not having a default value is set to ? (see P3 parameter). Last parameter shall always be a MDB pathname to an End Item of type CCSDS_END_NODE. The template is filled with CCSDS_END_NODE_? for this parameter notifying you to change it.

You can **copy/paste** the template string from this window to the Edit_Cmd_popup window using Motif style copy and paste. To do this follow the instructions below:

1. Highlight template. ***Hint:*** *“Triple Click” on the line.*

2. Press on the *Copy* key on the left side of your keyboard.

3. Close the *Onbaord_Commanding_popup* by pressing OK.

4. Click in the *Command* field (to the right of *Command:*) and press on the *Paste* key also found on the left side of your keyboard.

Now you have to modify CCSDS_END_NODE_? to a full pathname of a CCSDS_END_NODE and replace any “?” parameters with real parameters.

In the P1 parameter example we see the template is filled with “P1 => 5", which is a constant. Assuming you want an integer variable as input you just put in the name of an existing integer DDO on your synoptic display. Example you have a INT_001 integer DDO. The template for parameter P1 could then look like “P1 => INT_001”.

When you have completed entering and modifying the command press on the OK button. A limited syntax check is now made. If errors have been found these will be reported and you have to correct the errors before you can continue. A complete syntax check is made when the display is saved. This is done by calling the so called *CLS Editor*. If errors are found here these will be reported in the consistency checker window. Please note that changes done to referenced DDOS (eg. name changes) after the limited syntax check will be reported as an error by the FWDU, because the FWDU only checks the syntax at ***creation time*** of the command and ***not*** when renaming any DDOS.

Display type reference

If you do not yet know which display type to use, review ***Chapter 2***. Once you have selected the desired display type, you can read more about it on the following pages.

NOTE: A sample format is provided for each display type, and illustrated in this chapter. You can view these formats by selecting *Open* from the *File* menu of the *Format Editor Control* panel. When you have finished examining them, select D*ismiss* from the *File* menu to close the format without changing the samples.

When creating or modifying a display type, you will enter its specifications in the appropriate display panel. This panel, along with the general display specifications and data access panels, appear when you create or edit the display type. For more details, please refer to ***Chapter 3***.

When entering specifications on a panel, you can type information directly into some fields, while other fields are view-only. Certain field can have a toggle option; clicking in the field toggles between set responses. Fields could also have an associated list of choices, such as fields that require a colour or font name; click the mouse OPTION button to display a list and then click on the desired choice to enter it into the field.

Some DFDs will allow you to select a data type; these types are:

Short (2-byte integer)
Long (4-byte integer)
Float (single-precision 4-byte floating point**)**
Double (double-precision 8-byte floating point)

For DFDs that support text entry, you can type special and international characters using a Compose key along with appropriate keystrokes. See ***Appendix M*** for details.

Once you have completed all fields on this panel, click the mouse SELECT button on the *Enter* button. The *Reset* button restores all entries on the panel to the values they contained the last time they were saved.

The remainder of this chapter is an alphabetical reference to the display types:

- Alarm (Optional)
- Bar
- Barchart
- Curve Set
- Custom Time
- Dynamic Object
- Equation
- Formatted Numeric
- General Action Button (GAB; also called Button)
- General Action Button Grouping (also called Button Grouping)
- Graphic Data Field
- Graph (Plot/Trend)
- Integer
- Menu
- Meter/Gauge
- Meter, Fixed-Scale Linear
- Meter, Moving-Scale Linear
- Object Icon
- Option List
- Piechart

- Real
- Region
- Scrollbar
- Selection List
- Slider Bar (also called Slider)
- Symbol Table
- Tabular
- Text
- Text Browser Data Input/Output (also called Browser)
- Text Table

Alarm (optional)

Sample Format: *alarmwindow*

If your system includes the optional Alarm subsystem, you have access to several *alarm windows* supplied for displaying colour-coded messages about alarms and system events. These windows are suitable for most purposes, but you can also use the *Alarm* display type to create your own message displays. The messages fall into two general categories:

- **System events.** These are special functions performed by the *Sammi* user, such as entering data into a dynamic field, logging on/off, starting *Sammi*, etc. The message usually indicates what happened and when. For example, the following message may appear under certain conditions to indicate that a user who logged in as Sandia changed the value in a dynamic field from 12 to 15 at 3:01 p.m. on July 6, 1995:

  ```
  15:01:23 7-6-95 OPENTRY FROM SANDIA OLD = 12 NEW = 15
  ```

- **Alarms.** These are groups of data generated by external applications that are sent to *Sammi* via an API application when some process has a problem. The alarm message typically indicates what happened to cause the alarm. For example, the following message might appear if the temperature in a boiler exceeds safe limits:

  ```
  07:23:32 12-25-90 TEMPERATURE EXCEEDED AT UNIT #5
  ```

Alarms are classified in various ways; for specifics, please refer to ***Chapter 4 Using Alarms and Events*** of the ***System Administrator's Guide***. These classifications can be used to filter alarm messages so that only those in the desired classifications are shown (e.g., all active alarms, all unacknowledged alarms, etc.).

The *Sammi* user can control this filtering directly using the *alarm filter keys* on the *Sammi Alarm Menu*. The user can display messages for a given range of dates and choose whether they appear in chronological or reverse order. The user can also silence alarms by entering the *Sammi* **alarm-silence** command or by pushing a special button that you create in the Format Editor (see ***General Action Buttons*** later in this chapter).

Alarm messages are generated automatically by the system based on templates contained in the *alarm format file*, named `alm_format.dat`. This file is supplied with *Sammi*, and can be edited using any ASCII text editor. Alarm colours are defined in a separate table. ***Appendix H*** explains how to change these templates, add new messages, or change the colours associated with the alarm message levels.

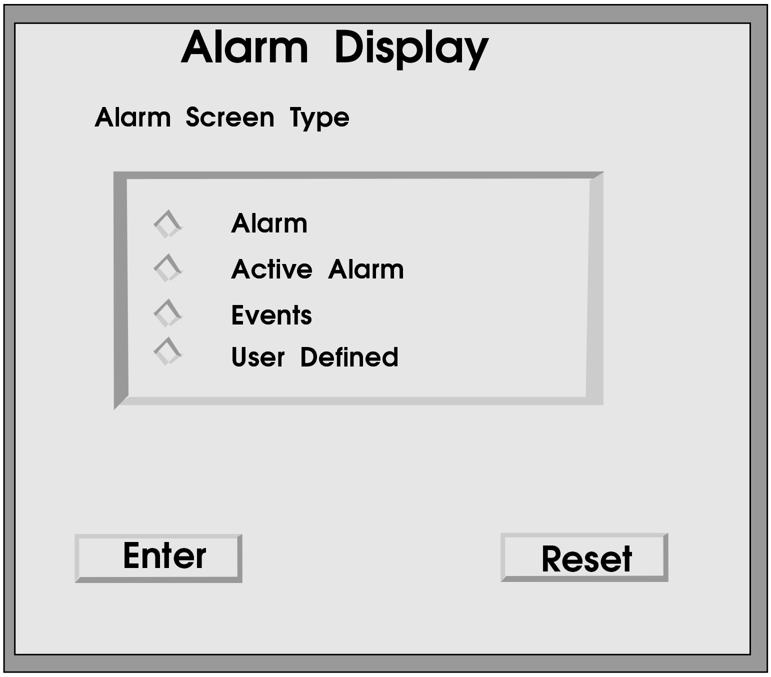
You can create any number of Alarm fields designed to display different types of alarms (see the ***Alarm Screen Type*** entry below). The message display will conform to the size of the dynamic field itself. Therefore, when you are creating a dynamic field for alarm messages, make sure it is wide enough to hold the longest possible message and high enough to show at least a few messages at a time.

The height limit on an alarm is 44 characters high (or 44 alarm messages), while the width limit is 131 characters long. For example, if the longest alarm message is 80 characters, then the dynamic field should be set at least 80 characters wide.

Since the total number of messages available at any given time may exceed the height of the alarm window, you can create a scrollbar for changing the view of the window. See the ***Scrollbar*** section later in this chapter.

Display type specifications

Enter the following specifications, as illustrated on the panel below:



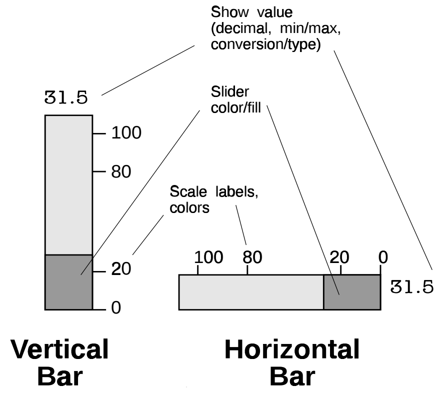
Alarm Display Entries

Entry Option	Description
Alarm Screen Type	Select the type of alarm window being created. By selecting one of the options below, you can set the initial filters for the window so that it shows only a given type of message. Click the mouse SELECT button on one of the buttons in the box below this field to select: Alarm Active Alarm Events User-Defined. (This is a filter window that the user can define.)

Bar

Sample Format: *sample_bar*

The *Bar* display type provides either a horizontal or a vertical bar graph, as shown in the illustration below. In either orientation, a colour bar increases or decreases in size to show the current data value.



For example, if the incoming data value is 31.5, the bar expands proportionally to line up with 31.5 on the scale (as based on defined minimum and maximum scale limits). Either real numbers or integers are acceptable as incoming data for this display type.

Sammi scales the bar graph automatically to fit the area covered by the dynamic field. When creating a bar graph, therefore, you can make the dynamic field any size (please refer to ***Chapter 6*** for details).

You can set the positioning and labelling of tick marks on the bar graph by entering minimum and maximum values for the overall scale and individual values for each tick mark. For example, in the illustration above, the minimum value on the scale is 0, the maximum value is 110, and the tick marks values are 0, 20, 80, and 100. Given these values, *Sammi* automatically positions the tick marks and labels along the bar at appropriate locations.

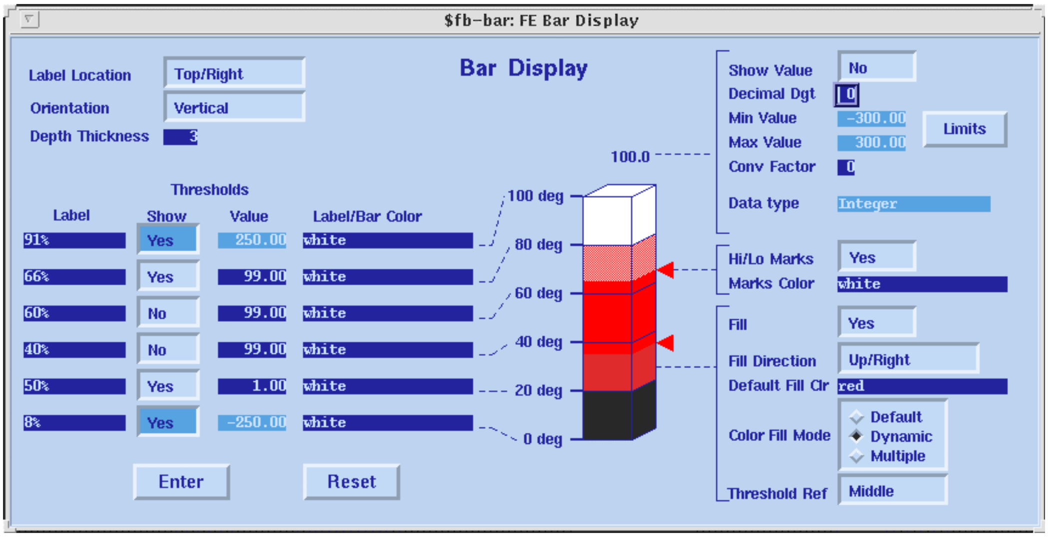
Also, you can specify the bar colours and the direction in which it moves (left-to-right, top-to-bottom, etc.). You can show the current data value at one end of the bar graph, too.

API information

The FWDU_SERVER sends only the current value. The limits and measurement end item type are passed to the FWDU_SERVER at preview and the FWDU_SERVER sends data between max and min.

Display type specifications

Enter the following specifications, as illustrated on the panel below:



$fb–bar: FE Bar Display

Bar Display

Label Location: Top/Right
Orientation: Vertical
Depth Thickness: 3

Thresholds

Label	Show	Value	Label/Bar Color
91%	Yes	250.00	white
66%	Yes	99.00	white
60%	No	99.00	white
40%	No	99.00	white
50%	Yes	1.00	white
8%	Yes	-250.00	white

Show Value: No
Decimal Dgt: 0
Min Value: -300.00
Max Value: 300.00
Conv Factor: 0
Data type: Integer

Hi/Lo Marks: Yes
Marks Color: white

Fill: Yes
Fill Direction: Up/Right
Default Fill Clr: red
Color Fill Mode: ◇ Default ◆ Dynamic ◇ Multiple
Threshold Ref: Middle

Bar Display Entries

Entry Option **Description**

Show Value

Select whether the incoming data value displays near the bar by clicking the mouse SELECT button in the box to the right of this field to toggle between *Yes* and *No*.

Decimal Dgt

If you selected *Yes* for *Show Value*, enter the number of digits to be included to the right of the decimal point in the displayed value (for real numbers only).

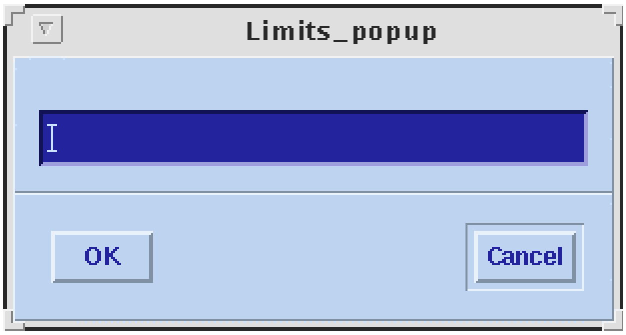
Min Value

Read-only. Data is automatically taken from measurement End Item when associating measurement End Item. Data is Engineering Range Low Value.

Max Value

Read-only. Data is automatically taken from measurement end item when associating measurement end item. Data is Engineering Range High Value.

If a measurement end item is attached, you can choose from the measurement End Item’s nominal limit set (range 1-5), by pressing Limits button. The following window appears:



Conv Factor Enter the conversion code for incoming data (see ***Appendix F*** for details).

Data Type Read-only. Data is automatically taken from measurement End Item when associating measurement end item.

Hi/Lo Marks Indicate whether high/low value markers will display by and clicking the mouse SELECT button in the box to the right of this field to toggle between *Yes* and *No*.

Marks Colour Either enter a colour for the high and low marks, or select a colour by clicking the mouse OPTION button in the field to the right of the *Marks Color*.

Fill Indicate whether the bar should be filled with the *Default Fill Clr*, or whether the position is to be shown as a moving line only. Click the mouse SELECT button on the buttons to the right of this field to toggle between *Yes* and *No*.

Fill Direction The default bar movement is from bottom to top (vertical bars) or left to right (horizontal bars). You can invert this direction, if desired. Click the mouse SELECT button on the buttons to the right of this field to toggle between Up/ Right and Down/Left.

Default Fill Clr When the *Color Fill Mode* is default, either enter a color for the fill color of the bar, or select a color by clicking the mouse OPTION button in the box to the right of this label.

Color Fill Mode Select how the bar fills its color. Click the mouse SELECT button on the buttons to the right of this field to select one of the following three options:

Default. The default fill color fills the bar.

Dynamic. The whole bar color changes to the threshold color.

Multiple. Only the part of the bar beyond a threshold changes to the threshold color.

Threshold Ref

Action of the bar color at the thresholds. Click the mouse SELECT button on the buttons to the right of this field to toggle between the following options:

Bottom. When a threshold is exceeded, the bar color changes to that of the threshold.

Middle. When the value reaches or exceeds the high-low, high-medium, high-high or the value drops below the low-high, low medium or the low-low, the bar color changes to that of the threshold. The bar is the *DFD Foreground Color* when the value is between the low-high, and the high-low thresholds.

NOTE: If you select Middle and use less than six threshold values, keep in mind that the middle is set by splitting the difference between the values entered in Threshold fields 3 and 4. Thus, you must enter six total values to get the proper results. You can duplicate values to fill out all six thresholds. For example, you can enter 100.00, 100.00, 60.00, 40.00, 20.00, and 0.00 for the values.

Label Location

By default, labels and tick marks are located to the right of vertical bar graphs or above horizontal bar graphs. You may invert this location or keep it the same by clicking the mouse SELECT button in the box to the right to toggle between Top/Right and Bottom/Left.

Orientation

Set the orientation of the bar by clicking the mouse SELECT button in the box to the right to toggle between *Vertical* and *Horizontal*.

Depth Thickness

For three-dimensional effects, enter the value (in pixels) for the width of the shadow of the bar.

For each threshold you want to use, enter the following values:

Label

Enter a label for each threshold. If you enter the environment variable, `$CUR-LIMIT`, the current threshold displays as the label at runtime.

NOTE: If you enter the *Max* and *Min* Values for the top and bottom labels respectively, you will have only four other thresholds to label.

Show

The Max and Min values are read-only. And *Yes* is always set.

Value

Max and min are read-only. The six Data values automatic taken from measurement end item when associating measurement end item. The six Values are:

Danger Limits High Value

Nominal Limit High Value

Nominal Limit High Value

Nominal Limit High Value

Nominal Limit Low Value

Danger Limits Low Value

Label & Bar Color

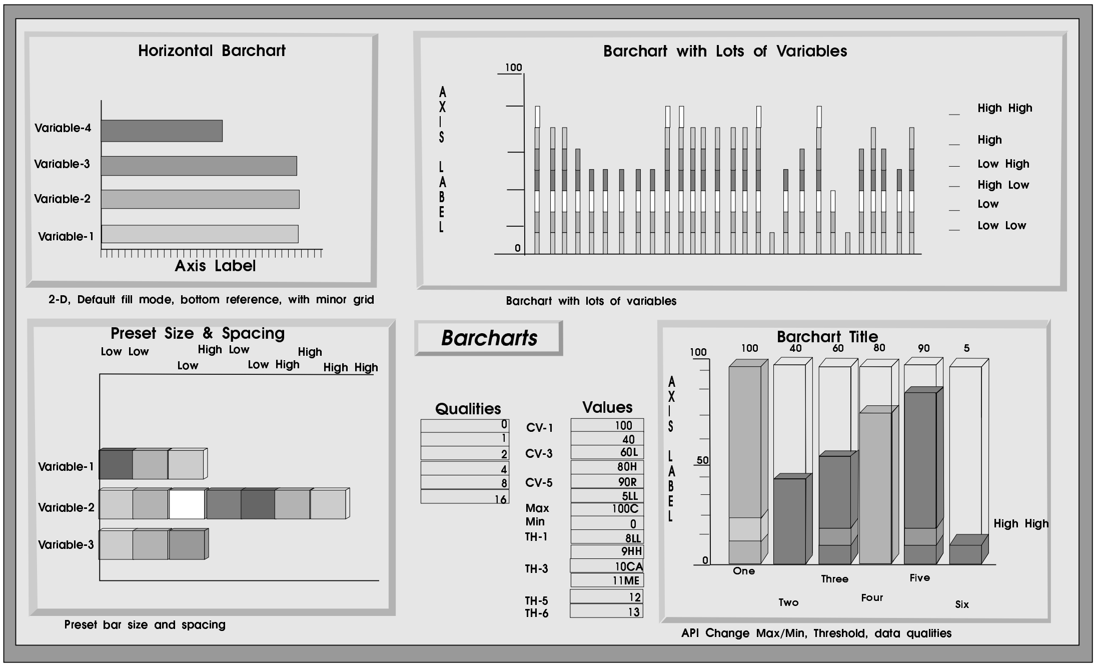
Either enter a label and the bar color for the threshold, or select a color by clicking the mouse OPTION button in the field below the *Label & Color* title and to the right of each threshold.

Barchart

Sample Format: *sample_barchart*

The *Barchart* display type is a *display-only* group of either horizontal or vertical bar graphs, as shown in the illustration below. With either orientation, color bars increase or decrease in size to show the current data value for multiple variables.

Either real numbers or integers are acceptable as incoming data for this display type. A single *Barchart* DFD can display up to 256 bars, but to preserve readability you should probably use no more than ten or twelve.



For the *Barchart* display type, you can:

- Create a title (optional).
- Define the size of the DFD.
- Choose the colors and the fonts for titles and labels.
- Choose to show a grid of either dotted or solid lines (optional). This grid cannot be displayed with three-dimensional bars.

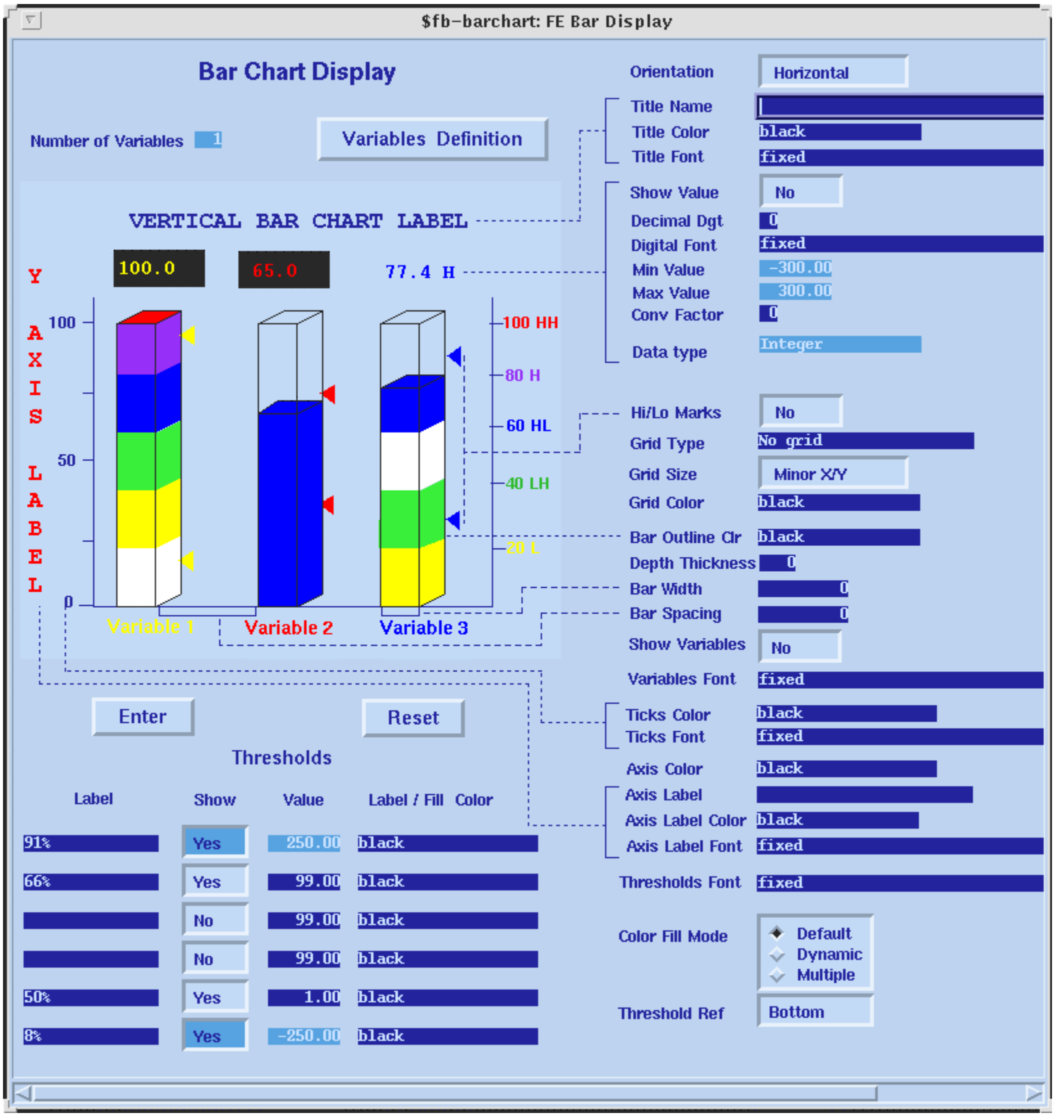
- Create labels (variables for each barchart) that may consist of:
  - — variable names that display below each bar on a vertical chart or to the left of each bar on a horizontal chart.
  - — variable values that display above each bar on a vertical chart or to the right on a horizontal chart.
- Choose the method and style with which the bars fill.
- Create and display threshold information.
- Choose a threshold reference method.
- Give the bars a three-dimensional appearance.
- Create and choose to display markers indicating the highest and lowest values that the data has achieved during a *Sammi* session.
- Create and display runtime annotations.

API information

The FWDU_SERVER sends only the current value for each bar. The limits and measurement end item type are passed to the FWDU_SERVER at preview and the FWDU_SERVER sends data between max and min.

Display type specifications

Enter the following specifications, as illustrated on the panel below. To enter information for the individual bars, click on the *Variable Definitions* button. (Information on completing the *Barchart Variables Display* panel follows this section.)



$fb–barchart: FE Bar Display

Bar Chart Display

Number of Variables 1

Variables Definition

Orientation	Horizontal
Title Name	
Title Color	black
Title Font	fixed
Show Value	No
Decimal Dgt	0
Digital Font	fixed
Min Value	-300.00
Max Value	300.00
Conv Factor	0
Data type	Integer
Hi/Lo Marks	No
Grid Type	No grid
Grid Size	Minor X/Y
Grid Color	black
Bar Outline Clr	black
Depth Thickness	0
Bar Width	0
Bar Spacing	0
Show Variables	No
Variables Font	fixed
Ticks Color	black
Ticks Font	fixed
Axis Color	black
Axis Label	
Axis Label Color	black
Axis Label Font	fixed
Thresholds Font	fixed
Color Fill Mode	◆ Default ◇ Dynamic ◇ Multiple
Threshold Ref	Bottom

Thresholds

Label	Show	Value	Label / Fill Color
91%	Yes	250.00	black
66%	Yes	99.00	black
	No	99.00	black
	No	99.00	black
50%	Yes	1.00	black
8%	Yes	-250.00	black

Barchart Display Entries

Entry Option	Description
Number of Variables	Display only- this value is calculated after you define the variables on the *Barchart Variables Display* panel. (To access the *Barchart Variables Display panel*, click the mouse SELECT button on the *Variables Definition* button.)
Orientation	Click the mouse SELECT button in the box beside this label to toggle between *Vertical* and *Horizontal* orientation.
Title Name	Enter the text string for the barchart title.
Title Color	Either enter a color for the chart title or click the mouse OPTION button in the box beside this label to display an option list. Then click the mouse SELECT button on the desired color name.
Title Font	Either enter a font for the *Title Name*, or click the mouse OPTION button in the box beside this label to display an option list. Then click the mouse SELECT button on the desired font name.
Show Value	Select whether to show the incoming data values for each bar (on top of each vertical or to the right of each horizontal bar) by clicking the mouse SELECT button in the box to the right of this field to toggle between *Yes* and *No*.
Decimal Dgt	If you selected *Yes* for *Show Value*, for real numbers only, enter the number of digits to the right of the decimal point to be displayed.
Digital Font	If you choose to show the value, either enter a font for the value, or click the mouse OPTION button in the box beside this label to display an option list. Then click the mouse SELECT button on the desired font name.

Barchart Display Entries (continued)

Entry Option — **Description**

Min Value

Read-only. Data is automatically taken from measurement End Item when associating measurement end item. The end item having the minimum value determines this value. Data is Engineering Range Low Value.

Max Value

Read-only. Data is automatically taken from measurement End Item when associating measurement end item. The end item having the maximum value determines this value. Data is Engineering Range High Value.

Conv Factor

Enter the conversion code for incoming data (see ***Appendix F***).

Data type

Read-only. Data is automatically taken from measurement End Item when associating measurement End Item

Hi/Lo Marks

Indicate whether high/low value markers will display by clicking the mouse SELECT button in the box to the right of this field to toggle between *Yes* and *No*.

Grid Type

For two-dimensional barcharts only- select the type of grid by clicking the mouse OPTION button in the box beside this label. Then click the mouse SELECT button on one of the options from the following list:

No grid. Suppresses the grid.

Line grid. Displays vertical lines on a horizontal and horizontal lines on a vertical barchart.

Dot grid. Displays the grid as points.

Barchart Display Entries (continued)

Entry Option **Description**

Grid Size
Click the mouse SELECT button on the button to the right of this field to select:

Major X/Y. Grid lines for major tick marks only.

Minor X/Y. Grid lines for all (major and minor) tick marks.

Grid Color
Either enter a color to be used for grid lines (if any) or click the mouse OPTION button in the box beside this label to display an option list. Then click the mouse SELECT button on the desired color name.

Bar Outline Clr
Either enter a color for the outline of the bar, or click the mouse OPTION button in the box beside this label to display an option list. Then click the mouse SELECT button on the desired color name.

Depth Thickness
For a three-dimensional effect, enter the value (in pixels) for the depth of the bar.

Bar Width
Enter the width of each bar in pixels.

Bar Spacing
Enter the spacing between each bar in pixels.

NOTE: If you enter 0 (zero) in both the *Bar Width* and *Bar Spacing* fields, the Runtime Environment creates bars of equal size within the area of the DFD.

Show Variables
Select whether each bar has a label (at the bottom for each vertical or to the left for each horizontal bar) by clicking the mouse SELECT button in the box to the right of this field to toggle between *Yes* and *No*.

Variables Font
If you choose to show variables, either enter a font for the label or click the mouse OPTION button in the box beside this label to display an option list. Then click the mouse SELECT button on the desired font name.

Barchart Display Entries (continued)

Entry Option **Description**

Ticks Color

Either enter a color for the axis tick marks, or click the mouse OPTION button in the box beside this label to display an option list. Then click the mouse SELECT button on the desired color name.

Ticks Font

Either enter a font for the tick marks, or click the mouse OPTION button in the box beside this label to display an option list. Then click the mouse SELECT button on the desired font name.

Axis Color

Either enter a color for the axis label, or click the mouse OPTION button in the box beside this label to display an option list. Then click the mouse SELECT button on the desired color name. Enter the text for the axis label.

Axis Label

Enter the text for the axis label.

Axis Label Color

Either enter a color for the axis label, or click the mouse OPTION button in the box beside this label to display an option list. Then click the mouse SELECT button on the desired color name.

Axis Label Font

Either enter a font for the axis label, or click the mouse OPTION button in the box beside this label to display an option list. Then click the mouse SELECT button on the desired font name.

Thresholds

Thresholds Font

Either enter a font for the thresholds labels, or click the mouse OPTION button in the box beside this label to display an option list. Then click the mouse SELECT button on the desired font name.

Barchart Display Entries (continued)

Entry Option — **Description**

Color Fill Mode

Select how the bar fill is colored. Click the mouse SELECT button on the buttons to the right of this field to select from these options:

Default. The default fill color fills the bar, regardless of the threshold.

Dynamic. The whole bar color changes to the threshold color when a threshold is reached.

Multiple. Only the part of the bar beyond a threshold changes to that threshold color.

Threshold Ref

Action of the bar color at the thresholds. Click the mouse SELECT button on the buttons to the right of this field to toggle between the following options:

Bottom. When a threshold is exceeded, the bar color changes to that of the threshold.

Middle. When the value reaches or exceeds the high-low, high-medium, high-high or the value drops below the low-high, low medium or the low-low, the bar color changes to that of the threshold. The bar is the *DFD Foreground Color*, when the value is between the low-high, and the high-low thresholds.

Label

Enter a label for each threshold. If you enter the environment variable `$CUR-LIMIT`, the current threshold value displays as the label at runtime.

Show

The Max and Min values are read-only (always Yes).

Value

Max and min are read-only. The six Data values are automatic taken from the first entered measurement End Item when associating measurement End Items. The six values are:
Danger Limits High Value
Nominal Limit High Value
Nominal Limit High Value
Nominal Limit High Value
Nominal Limit Low Value
Danger Limits Low Value.

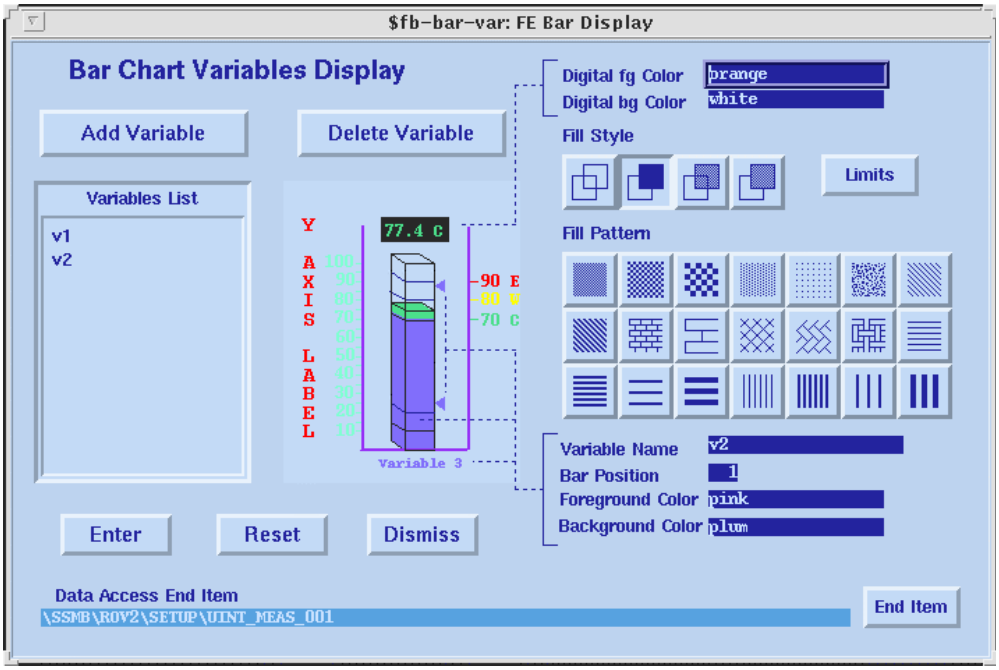
Barchart Display Entries (continued)

Entry Option — **Description**

Label/Fill Color — Either enter a color for the label and bar for each selected threshold, or click the mouse OPTION button in the box under this label to display an option list. Then click the mouse SELECT button on the desired color name.

Barchart variables display type specifications

To enter legend variables, click on the *Variables Definition* button of the *Barchart Display* panel. Enter the following specifications, as illustrated on the panel below.



Variables List: v1, v2

Digital fg Color: orange
Digital bg Color: white

Variable Name: v2
Bar Position: 1
Foreground Color: pink
Background Color: plum

Data Access End Item: \SSMB\ROV2\SETUP\UINT_MEAS_001

To add a variable, click on the *Add Variable* button, then enter information for the variable in the appropriate fields. Once you have entered information for a variable, either press the Return key or click the mouse SELECT button on the *Enter* button to save your entries.

There are two ways to add a variable to the middle of an existing list of variables:

- Click the mouse SELECT button on the variable name just above where you want to add a new variable, then click the mouse SELECT button on the *Add Variable* button. Type in the information for the new variable, and either press the ENTER key or click the mouse SELECT button on the *Enter* button.

- Click the mouse SELECT button on the *Add Variable* button. Type in the information for the new variable, changing the *Bar Position* field to the location of the new variable and either press the ENTER key or click the mouse SELECT button on the *Enter* button.

In either case, the *Bar Position* field for all variables that follow the one that you add are automatically updated, and the variable list is sorted in *Bar Position* order. (When the Barchart is displayed, the bar position for vertically-oriented charts is numbered from left to right, for horizontally-oriented charts from bottom to top.)

To change a variable, click the mouse SELECT button on the name in the *Variables List.* Make your changes in the appropriate fields and either press the ENTER key or click the mouse SELECT button on the *Enter* button.

To delete a variable, click the mouse SELECT button on the name in the *Variables List.* Then click the mouse SELECT button on the *Delete Variable* button. If you do not select a variable name and click the mouse SELECT button on the *Delete Variable* button, you delete the variable at the top of the list.

The *Reset* button restores all entries on the panel to the values that they contained the last time you saved them.

When you have added and saved all the variables, close this panel by clicking the mouse SELECT button on the *Dismiss* button.

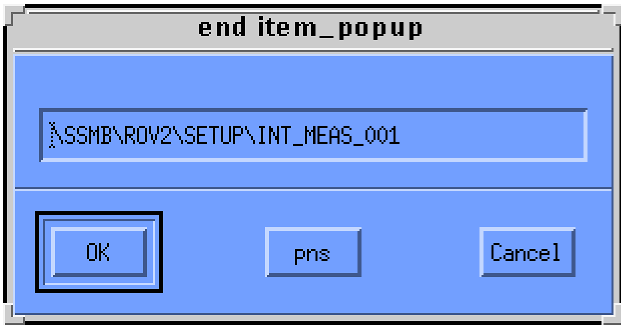
Barchart Variable Display Entries

Entry Option	**Description**
Digital fg Color	Either enter a color for the foreground color for the variable value, or click the mouse OPTION button in the box beside this label to display an option list. Then click the mouse SELECT button on the desired color name.
Digital bg Color	Either enter a color for the background color for the variable value, or click the mouse OPTION button in the box beside this label to display an option list. Then click the mouse SELECT button on the desired color name.

Barchart Variable Display Entries (continued)

Entry Option	Description
Fill Style	Click on a button below this title to indicate the fill style.
Fill Pattern	Click on a button below this title to indicate the fill pattern.
Variable Name	Enter the text for the variable name.
Bar Position	This position is based on the relative location of the variable; that is, zero (0) is the first bar on the left of the vertically-oriented barchart or the bottom bar on the horizontally-oriented barchart. Normally, this field is filled as you add a variable, but you can change the position of the variable by entering another number. This causes the variable list to re-sort in bar position order.
Foreground Color	Either enter a color for the foreground for the variable name, or click the mouse OPTION button in the box beside this label to display an option list. Then click the mouse SELECT button on the desired color name.
Background Color	Either enter a color for the background for the variable name, or click the mouse OPTION button in the box beside this label to display an option list. Then click the mouse SELECT button on the desired color name.

*Data Access End Item(per variable)*1.Select a variable. Press the End Item Button. The following window appears:



end item_popup

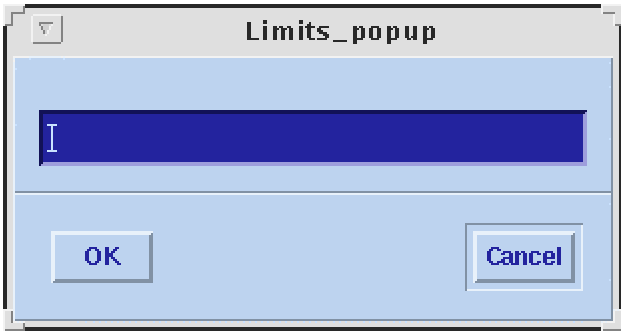
\SSMB\ROV2\SETUP\INT_MEAS_001

2. Complete the Pathname (a measurement End Item) (or use Pathname Support.)

3. Press OK button. The Data Access End Item field above is filled.

Limits Button

If a measurement End Item is attached, you can choose from the measurement End Items nominal limit set (range 1-5), by pressing Limits button. The following window appears:



Curve Sets

Curve Sets are **NOT SUPPORTED** by the FWDU.

Custom Time

Sample Format: *ndbm 08* (contains a Custom Time DFD)

The *Custom Time* display type displays the time and/or date. The display can be completely customized to include dates and times mixed with words or punctuation in any combination. For example:

```
Format: %H:%M:%S   %d %b %Y

Result: 20:30:04   05 Apr 1991
```

or

```
Format:  The time is %l:%M %p %Z on %A, %e/%o/%y.

Result: The time is 2:30 p.m. CST on Thursday, 11/1/90.
```

Special *insertion codes*, beginning with a percent sign (%), are used to indicate variable time and date values that the computer's operating system must insert automatically. Insertion codes are defined later in this section.

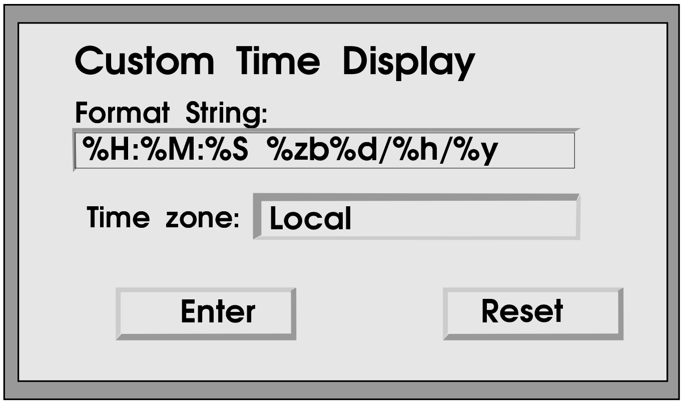
Based on the codes you use, *Sammi* automatically inserts the correct date and time, along with standard names or abbreviations for the day of the week (Friday, Fri), month (April, Apr), and time zones (EASTERN, EST). You can change these to any spelling or foreign language desired by editing the files named `timnames.dat` and `timzones.dat` in the `$FWDU/lib` directory. (Instructions for editing these files are described in ***Chapter 7*** of the ***System Administrator's Guide***.)

The inserted time and date values are all calculated from a single integer value that represents the number of seconds elapsed since January 1, 1970, Greenwich Mean Time. This value can be provided by the system clock or by an application, depending on the data access type you use.

NOTE: A custom time DFD that has a Data Access Type of Universal can be blanked out if the application sends the value -2000000000 (minus 2 billion) to the DFD.

Display type specifications

Enter the following specifications, as illustrated on the panel below:



Custom Time Display

Format String: %H:%M:%S %zb%d/%h/%y

Time zone: Local

Custom Time Display Entries

Entry Option **Description**

Format String

Enter the appropriate combination of words, punctuation, and insertion codes needed to produce the desired customized time/date display. Valid punctuation includes `:  ;  ,  -  /` and |. Valid insertion codes are as follows:

%a = abbreviated week day name (Tue)
%A = week day name (Tuesday)
%h or b = abbreviated month name (Apr)
%B = month name (April)
%m = month number (01-12)
%o = month number (1-12)
%d = day of month (01-31)
%e = day of month (1-31)
%H= hour (00-23)
%k = hour (0-23)
%I = hour (00-12)
%l = hour (1-12)
%M =minute (00-59)
%S = second (00-59)
%p =equivalent of AM or PM
%Z = time zone abbreviation (EST)
%z = time zone name (EASTERN)
%j = day number of year (001-366)
%Y = year, including century (1991)
%y = year within century (00-99).

Custom Time Display Entries (continued)

Entry Option **Description**

NOTE: You can display a pop-up help menu containing a description of the specifiers listed on the previous page by moving the mouse cursor into the Format String entry block and holding down the SHIFT key while clicking the mouse OPTION button.

Time Zone

Select the time zone code to be used for converting the time value from Greenwich Mean Time. This code can be selected from a pop-up menu. Twenty-six one-hour world time zones are kept in the `timzones.dat` file. The Daylight Savings Time start and end dates are also stored in this file.

The time zone can also be "local". In this case, the *Custom Time Display* type determines how to convert the time value by calling operating system time functions.

NOTE: If the time zone entry in the file does not have Daylight Savings Time start and end dates, or the start and end dates are not valid for the date/time corresponding to the converted time value, Daylight Savings Time corrections will not be applied to the time value.

Dynamic Objects

Sample Format: *sample_dobj*

The *Dynamic Object* display type allows you to turn a static object and/or dynamic field into a data-activated DFD that can rotate, blink, or change appearance (for example, appear to fill) based on incoming data values. A group of static objects and/or DFDs can be turned into a *Dynamic Objec*t that can be rotated or scaled.

NOTE: The Graphic Data static object *cannot* be made into a *Dynamic Object* DFD.

These special effects are produced by *Sammi*, as it compares incoming data to a lookup table (FWDU_DYNAMIC_OBJECT_TABLE_TEXT) to find out how to change the appearance of the object(s).

You must:

- Create a FWDU_DYNAMIC_OBJECT_TABLE_TEXT End Item in the MDB via I_MDB.
- Invoke the End Item.
- Edit the End Item in the fwdu_editor.
- Save the End Item in the MDB.

The table format depends on which lookup method you select: table lookup or value substitution; these two methods are discussed later in this section.

To create a *Dynamic Object* DFD using a desired object or group of objects, go to the *Dynamic Field* option on the *Format Editor Control Panel* and either:

- Select *Display Palette*. Select the *Dynamic Object* icon from the palette, and place it on top of the desired object or group (see ***Chapter 6***), or
- Select *Add DFD*. Then click to set the upper left and lower right corners of the DFD to enclose the object or group. Enter “Dynamic Object” in the *Display Type* field of the *DFD Display* panel.

Number of objects

The *Dynamic Object* display type determines the number of background objects that it controls as a result of any of five separate actions:

1. The *Dynamic Object* dynamic field is edited and saved using the *Save DFD* button on the *DFD Display* panel.

2. The *Dynamic Object* dynamic field is moved, either by using the *Move Tool* on the *Format Editor Control* panel or by changing the value of the *X* and *Y Locations* on the *DFD Display* panel.

3. The *Dynamic Object* dynamic field is resized either by using the *Resize Tool* on the *Format Editor Control* panel or by changing the values in the *Width* and *Height* fields on the *DFD Display* panel.

4. The *Dynamic Object* dynamic field is transformed by rotating or flipping it using the *Mirror Tools* on the *Format Editor Control* panel.

5. The format is written to a file using the *File* menu of the *Format Editor Control* panel.

Only objects in the same layer as the *Dynamic Object* dynamic field can be controlled by the *Dynamic Object*.

Grouping Dynamic Objects

Dynamic Object dynamic fields can be contained in a group. In this case, the *Dynamic Object* dynamic field includes only objects that are also part of the same group as the *Dynamic Object* dynamic field. This allows you to build a dynamic part (or composite) that can be used in different formats or different places on the same format and be controlled by the *Dynamic Object* dynamic field, or to draw other objects in the area controlled by the *Dynamic Object*. To do this, group the objects (controlled by the *Dynamic Object* dynamic field and the *Dynamic Object*) using the *Group Tool* of the *Format Editor Control* panel.

Dynamic Object tables

To enable the effects of a *Dynamic Object* DFD, you must create a lookup table that specifies certain changes to the DFD depending on incoming data. Each row has sixteen fields; these are described later in this section. The first field holds a number expressing the upper limit of a data range, with the limits arranged in ascending order. When the Runtime Environment receives a value for a *Dynamic Object* DFD, it compares that value to this first entry.

When it finds a row whose upper-limit value is equal to or greater than the incoming value, the display qualities specified in the previous row are applied to the *Dynamic Object*.

NOTE: If the incoming value exceeds the last range value in the table, the row selected will always be associated with the last range. For example, if the last (highest) entry in field one is 40, incoming values of 40.1, 50, etc., default to the display properties associated with the row preceded by 40.

A dynamic object table, which must be given the extension `.dobj`, can be in either of two formats, depending on the method most appropriate for your application:

- **Table Lookup.** In this format *Sammi* uses pre-determined values entered in the table.
- **Value Substitution.** In this format values are sent from an application to fields in the table indicated by variables.

Table lookup

This method uses a single incoming data value to control the attributes of the dynamic object. The first column in the table provides ranges to which the incoming value is compared.

In the example below, an incoming data value of 25, which falls between 20.0 and 30.0, activates the display properties from the second row (the one beginning with 20.0). The remaining values on each row control the relative position, appearance, and drawing characteristics of the dynamic object for that particular range of data; an entry of **d** (for default) indicates the current attribute is not modified. The numbers below the sample table are keys to the explanation of fields later in this section: (The numbers on the bottom row represent field numbers):

```
table_lookup
10.0  red   green noblnk  0  0  0  3  0  d   d   d  d  d  d  0
20.0  blue  green noblnk  d  d  1  1  2  d   d   d  d  d  d 25
30.0  green red   blink   d  d  0  1  4  125 125 d  d  d  d 50
40.0  black blue  blink   2  2  d  d  6  80  80  d  d  e  d 75
1     2     3     4       5  6  7  8  9  10  11  12 13 14 1516
```

The table must have the title `table_lookup` as the first non-comment line.

Value substitution

This method controls the effects of the dynamic object with a set of incoming data values. Variables using **v** as a prefix are used to show which entries in the table are to be controlled by the data server.

Other values are the same as those defined for the table-lookup method. You can have up to 16 variables (`v0..v15).` The row-selecting value, which is compared to the first field to find the upper range limit, is always `v0`. The range limits (column 1) can never be substituted (changed) by the data source (an application).

The following sample file shows how value substitution can be used to allow the application to directly control the foreground colors of the dynamic object. Assuming the data server is designed to send data to this dynamic field in the form of foreground color values with varying stipple patterns, *Sammi* inserts these values at `v1` and `v2` in the table. *Sammi* compares the incoming `v0` value to the first value in each row until it finds one greater than or equal to the incoming data value, then uses the display properties in that row. Again, the numbers below the sample value substitution table reference the description of fields which follows.

The variable number references its occurrence as a variable, not its relative column position. Also, a column's values can mix variables and non-changing elements, and the non-changing elements can mix specific and default (assigned with the *Drawing Tools*) values. The numbers on the bottom row in the following table represent field numbers:

```
value_substitution
10.0  v1  greennoblnk0  v2 0  3  0  d  d  d  d  d  d  0
20.0  v1  greennoblnkd  v2 1  1  2  d  d  d  d  d  d  25
30.0  v1  red   blink d  d  0  1  4  125125d  d  d  d  50
40.0  v1  blue  blink 2  2  d  d  6  80 80 d  d  d  d  75
-------------------------------------------------------
1     2   3     4     5  6  7  8  9  10 11 12 13 14 15 16
```

You can use the `v0` value in another column. For example, in the table above, changing `v2` to `v0` links stippling to the row-selecting value. Be aware that if `v0` is greater than the highest possible value for stippling (see ***Table field definitions*** below), results will be unpredictable.

You can even switch variables if the two values concerned are the same type. For example, in the table below, the background and foreground colors switch at a value of more than 20:

```
value_substitution
10.0  v0   v1   noblnk   0  0  0  3  0  d   d   d  d  d  d  0
20.0  v0   v1   noblnk   d  d  1  1  2  d   d   d  d  d  d 25
30.0  v1   v0   blink    d  d  0  1  4  125 125 d  d  d  d 50
40.0  v1   v0   blink    2  2  d  d  6  80  80  d  d  e  d 75
```

The table must have the title `value_substitution` as the first non-comment line.

Table field definitions

1 *Upper range limit* The number to which an incoming value is compared to determine which row to use for the Dynamic Object's attributes.

2 *Foreground color*
3 *Background Color* You can use any color listed in ***Appendix A***, unless the blinking feature is enabled (below). If blinking is enabled, the blinkable color choices are red, green, blue, yellow, white, black, cyan, or magenta. Attempting to blink the non-blinkable color will use the color indicated, and ignore the blink attribute.

4	*Blink/No blink*	Enter *blink* or *noblink*.
5	*Fill style*	Enter a value of 0 to 3. These correspond to the fill patterns found on the *Current Fill Style* panel, with the left pattern having a value of 0 and the right pattern having a value of 3.
6	*Stipple pattern*	Enter a number from 0 to 21. These correspond to the fill patterns on the *Current Fill Style* panel. The first row, reading from left to right, corresponds to the values 0-10, the second row to values 11-21.
7	*Line fill style*	Enter a number from 0 to 2. These correspond to the line fill styles on the *Current Line Style* panel, with the top fill style having a value of 0, the second, a value of 1, the third, a value of 2.
8	*Dash style*	If you selected 1 or 2 for “Line fill style,” enter a value of 0 to 5. These correspond to the dash patterns found on the *Current Line Style* panel, with the top dash style having a value of 0 and the bottom a value of 5. If you selected 0 for line fill, enter **d**.
9	*Line thickness*	Enter a value. If you enter a value from 0 to 7, these correspond to the line thicknesses found on the *Current Line Style* panel, with the top line thickness having a value of 0 and the bottom having a value of 7. Any value of eight or greater directly specifies a pixel thickness.
10 11	*x scale* *y scale*	To enlarge, shrink, or distort the dynamic object, enter the scaling percentages for both the horizontal (x) and vertical (y) scale. For example, entering “125 100” would enlarge the dynamic object by 25 percent horizontally but leave it the same size vertically. No fractional percentages are allowed.
12 13	*x position* *y position*	If you want the dynamic object to move to another location on the screen, enter the horizontal (x) and vertical (y) coordinates in pixels, as measured from the upper left corner of the format. See ***Appendix E*** for a discussion of pixel measurements.

14 *Rotation*

If you want the dynamic object to rotate clockwise around a rotation point, enter the angle of rotation for the dynamic object in degrees times 64 (rotation is specified in sixty-fourths of a degree); the rotation point is an attribute of gravity (see below). Rotation is clockwise for positive values.

15 *Gravity*

This is the rotation and transformation reference point. That is, if a dynamic object is to rotate, this value determines the axis on which it rotates. If a dynamic object is to be scaled, this value determines the point from which it is scaled. It is also used for dynamic objects that appear to fill in responses to incoming data values.

The gravity values are:

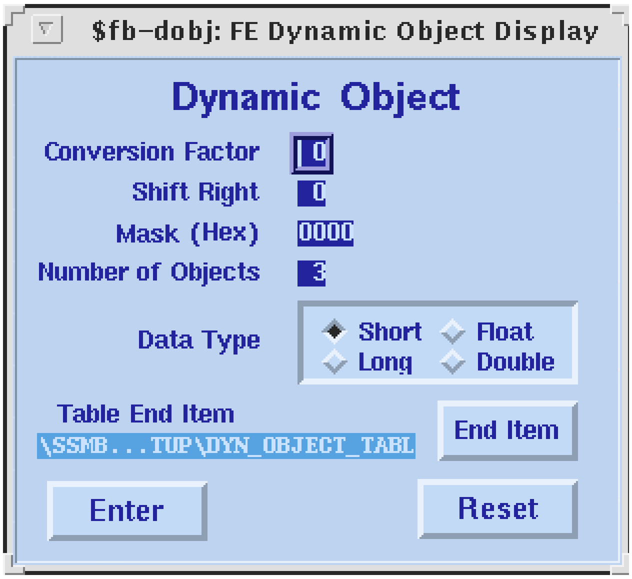
1	NW	(upper left; fill: top down)
2	N	(top center; “ ” “)
3	NE	(upper right; ” “ ”)
4	W	(left center; fill: left to right)
5	Center	(center; fill: top down)
6	E	(right center; fill: right to left)
7	SW	(lower left; fill: bottom up)
8	S	(lower center “ ” “)
9	SE	(lower right ” “ ”)
0	Default	(fill: top down)

16 *Fill level*

If you wish to use the fill feature for a dynamic object, this field expresses, as a percentage, how much to fill for a given value range. The direction of fill is determined by the gravity (see above).

Display type specifications

Enter the following specifications, as illustrated on the panel below:



$fb–dobj: FE Dynamic Object Display

Dynamic Object

Conversion Factor: 0

Shift Right: 0

Mask (Hex): 0000

Number of Objects: 3

Data Type: ◆ Short ◇ Float ◇ Long ◇ Double

Table End Item: \SSMB...TUP\DYN_OBJECT_TABL

Dynamic Object Entries

Entry Option	Description
Table Name	Enter the filename of the lookup table, without the `.dobj` extension.
Conv Factor	Enter the conversion code for incoming data (see ***Appendix F*** for details).
Shift Right	For certain applications where you want to isolate specific bits in the data value, enter the number of bits to shift right. For more information, see ***Appendix G Shifting and Masking***.
Mask (Hex)	For certain applications where you want to isolate specific bits in the data value, enter the mask value to apply to the data value after shifting. For more information, see ***Appendix G Shifting and Masking***.

Dynamic Object Entries (continued)

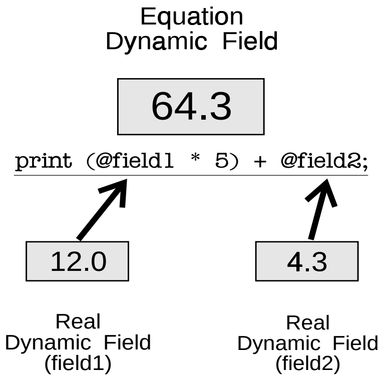
Entry Option	Description
Number of Objects	Calculated and displayed automatically based on the number of drawn objects enclosed in the dynamic field after you click the mouse SELECT button on the *Enter* button. The value displayed in this field before you press the *Enter* button shows you how many objects are part of the *Dynamic Object* dynamic field before it is entered.
Data Type	The type of data being used to drive the dynamic field. Click the mouse SELECT button on one of the buttons to the right of this field to select one of the following options: **Short** **Long** **Float** **Double**
Table End Item	End Item of type FWDU_DYNAMIC_OBJECT_TABLE_TEXT.

NOTE: The *Shift Right* and *Mask* operations are performed only on *Short* and *Long* Data types.

Equation

Sample Format: *sample_eqn*

With the *Equation* display type, you create a dynamic field that displays values which are derived from other dynamic fields, based on an algorithm you create. The diagram above shows an example.



How the Equation Display Type Works

The *Equation* display type in this diagram uses the values from two other dynamic fields (`field1` and `field2`) to produce and display its own value. To do this, it multiplies the value in `field1` by 5, then adds the value in `field2.`

The actual equation used to produce the example result is:

```
print (@field1 * 5) + @field2;
```

Of course, since `field1` and `field2` are both dynamic fields receiving data from outside sources, their values can change continuously. Each time their values change, the *Equation* display type is recalculated and redisplayed.

The *Equation* display type gives *Sammi* windows many of the capabilities of a spreadsheet. When you use the *Equation* display type, the dynamic fields in *Sammi* behave like the cells in a spreadsheet.

NOTE: The names of dynamic fields referenced in an equation cannot contain characters other than alphabetical characters, numbers, and the “_” (underscore) character, and must begin with an alphabetical character. A common mistake is referencing a dynamic field whose name contains a “-” (dash). The *Equation* display type translates this as a minus.

In the example diagram, notice several important features about how the equation was stated:

- An equation is a series of statements separated by semicolons (;).
- The word `print` displays the result of the equation in the *Equation* dynamic field. Other such keywords are explained below and shown in an accompanying table later in this section.
- You reference other dynamic fields (*Real* and *Integer* only) within the equation by placing an @ symbol before their *DFD Names*. This makes the dynamic field value a working part of the equation.
- Standard spreadsheet symbols like *, +, -, /, and others are used to indicate mathematical functions like multiplication, addition, etc. Other such symbols are explained below and shown in an accompanying table later in this section.
- Parentheses are used to isolate parts of the equation that must be calculated individually, just as in standard mathematical equations like the following:
  `x = (y + 1) * 2`
- Spaces can be included to visually separate elements of the equation.

The accompanying table later in this section shows the typical symbols, functions, and constants that can be used with an *Equation* dynamic field. A more thorough discussion of the equation language is provided in ***Appendix I*** of this guide.

If you are a C-language programmer, you can write small C-type routines using this function. You can use these building blocks to produce fairly complex logical statements, such as the following:

```
if (@field2>=0) print sqrt(@field2*PI) else print "imaginary" ;
```

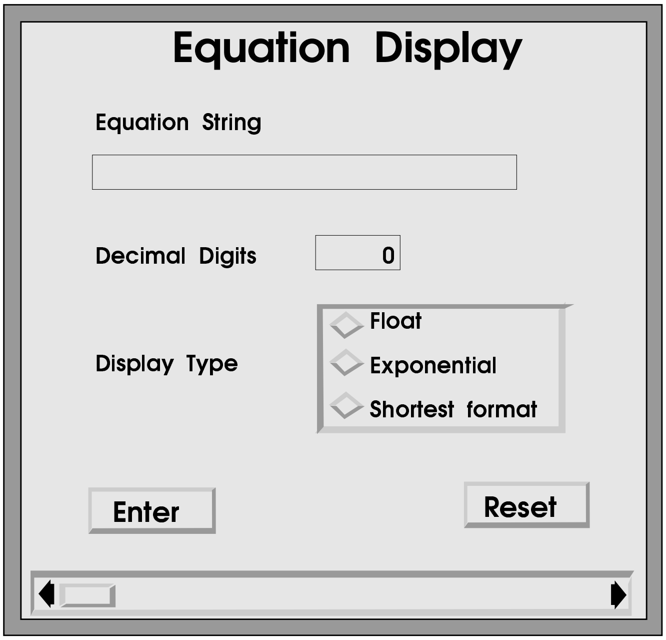
This equation is read as follows: If the value in `field2` is greater than or equal to zero, then display the square root of `field2` times `pi.` Otherwise, display the message “imaginary.”

You can create as many *Equation* dynamic fields as desired within a given format. When creating an *Equation* dynamic field, make sure it is only one character high and wide enough to fit the largest possible value. If any value calculated during runtime is too wide for the *Equation* dynamic field, a row of asterisks (***) will be shown instead of the value.

You can help reduce the width requirements of an *Equation* dynamic field by selecting the *Shortest format* button from the *Equation Display* panel, as explained below. This causes the result to be displayed as a decimal number or as an exponential number (e.g., 1.E+6 for 1,000,000.00), whichever is shorter.

Display type specifications

Enter the following specifications, as illustrated on the panel below:



Decimal Digits 0

Equation Display Entries

Entry Option	Description
Equation String	Enter the equation for the dynamic fields (up to 255 characters). For long equation entries, use the horizontal scroll bar at the bottom of the panel.
Decimal Digits	Enter the number of digits to be displayed to the right of the decimal point for the equation results.
Display Format	Select the format for displaying the equation results. Click the mouse SELECT button on one of the buttons to the right of this field to select a display format: **Float** **Exponential** **Shortest format** (Float or Exponential)

Equation Symbols, Functions, and Constants

Mathematical Operators (in decreasing order of precedence)

^	exponentiation (FORTRAN**), right associative
!	(unary) logical and arithmetic negation
* /	multiplication, division
+ -	addition, subtraction
> >=	greater, greater or equal
< <=	less, less or equal
== |=	equal, not equal (same precedence)
&&	logical AND (both operands always evaluated)
||	logical OR (both operands always evaluated)
=	assignment, right associative

Built-in Functions

abs(x)	|x|, absolute value of x
atan(x)	arc(x), arc tangent of x
cos(x)	cos(x), cosine of x
exp(x)	e^{x}, exponential of x
int(x)	integer part of x, truncated towards zero
log(x)	log(x), logarithm base e of x
log10(x)	log$_{10}$(x), logarithm base 10 of x
sin(x)	sin(x), sine of x
sqrt(x)	Àx, square root of x

Equation Symbols, Functions, and Constants (continued)

Built-in Constants

DEG	180/π degrees per radian
E	e, base of natural logarithms
GAMMA	g, Euler-Mascheroni constant
PHI	(√5+1)/2, the golden ratio
PI	p, ratio of circumference to diameter

Formatted Numeric

Sample Format: *sample_fdata*

The *Formatted Numeric* display type converts (formats) data from an application prior to displaying it. Once the data is displayed in one of these dynamic fields, the *Sammi* user can click the mouse SELECT button on the dynamic field to display the data using the next conversion in the file for the type of data displayed. This process repeats itself until the end of the conversion file is reached, when *Sammi* recycles to the top of the file. To create a FWDU_CONVERSION_TEXT End Item you have to:

- Create a FWDU_CONVERSION_TEXT End Item in the MDB via I_MDB.
- Invoke the End Item.
- Edit the End Item in the fwdu_editor.
- Save the End Item in the MDB.

Now you can reference the End Item from the FWDU.

The FWDU_CONVERSION_TEXT file entries consist of C-language format strings for the data followed by the conversion equation for the data. (For information on the equation language, see the ***Equation*** display type and ***Appendix I***.)

The following example is an entry in the conversion (FWDU_CONVERSION_TEXT) file to convert incoming data (defined using the @ symbol) inches to centimeters, meters, and feet:

```
"%lf in"
"@"
"%lf ft
"@ / 12.0"
"%lf cm"
"@ * 2.54"
"%lf m"
"@ * .0254"
```

API information

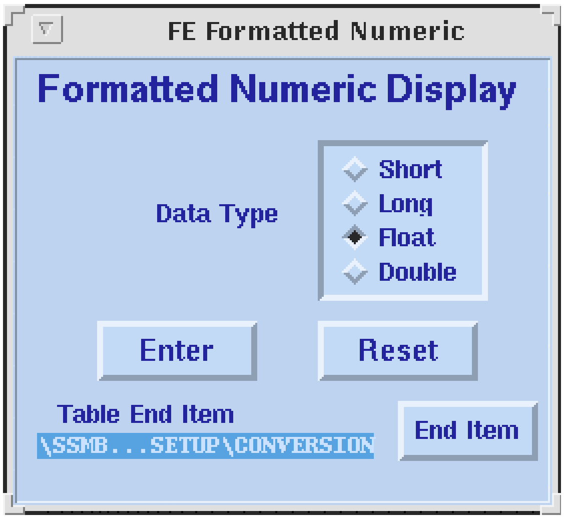
The runtime data buffer for the *Formatted Numeric* display type must contain a minimum of two values: the current value to be converted and the index into the FWDU_CONVERSION_TEXT file where the conversion is located. The first entry is always the current value followed by the index.

If your *Formatted Numeric* is a data set, your data values must provide the current values (for each displayed value) followed by an index value, and all values have to be of the same data type; that is, short, long, float, or double.

You must set the *Number of Values* field on the *Data Access Description* panel to the total number of values that you are receiving from the application; that is, one more than the number of values that you are displaying at a time. The minimum number that you can enter in the *Number of Values* field is 2. (See ***Chapter 8*** of this guide for more information.)

Display type specifications

Enter the following specifications, as illustrated on the panel below:



Data Type
◇ Short
◇ Long
◆ Float
◇ Double

Table End Item
\SSMB...SETUP\CONVERSION

Formatted Numeric

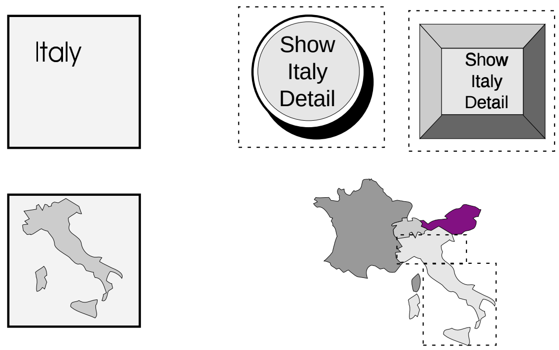
Entry Option	**Description**
Table End Item	End Item of type FWDU_CONVERSION_TEXT.
Data Type	Is set automatically.

General Action Button (GAB)/Button

Sample Format: *sample_gabutton*

The *General Action Button (GAB)* display creates a graphical image of a button (push or toggle) on which the *Sammi* user can click the mouse SELECT button to perform a specific function. For example, you might create buttons that add windows to the screen, silence alarms, set an attribute, etc. Each button in the *Sammi* Command window was created using this display type.

You can create two variations of buttons, visible and transparent. Both are illustrated below:



Visible
Push Buttons

Transparent
Push Buttons

- **Visible buttons.** *Sammi* can provide several types of visible buttons containing the text or symbol of your choice. Standard push buttons, with text or symbols, may be created. Toggle buttons, with or without indicators, may also be created with text or symbols. All buttons may be specified with variable-sized three-dimensional shading, which gives them the appearance of being raised or pressed in, depending on their current state.
- **Transparent buttons**. You can also define a transparent area of the screen that acts like a button when clicked on. This is useful if you want to create your own fancy buttons, or to have some part of a background image (such as a country on a map) that can be clicked on to activate other windows or functions.

  In the illustration above, the dashed lines show the actual borders of the transparent buttons. The two transparent buttons at the upper right contain background objects drawn with the Format Editor *Drawing Tools*. The map of southern Europe is part of a background image imported into the Format Editor. The map example shows how multiple transparent buttons can be used to cover an irregular area; all are programmed to perform the same function. The area of a format where you want to sense a user mouse click, must be covered completely by dynamic fields of this type.

Since both the visible and transparent push buttons work the same way, you can use whichever one best suits your purposes.

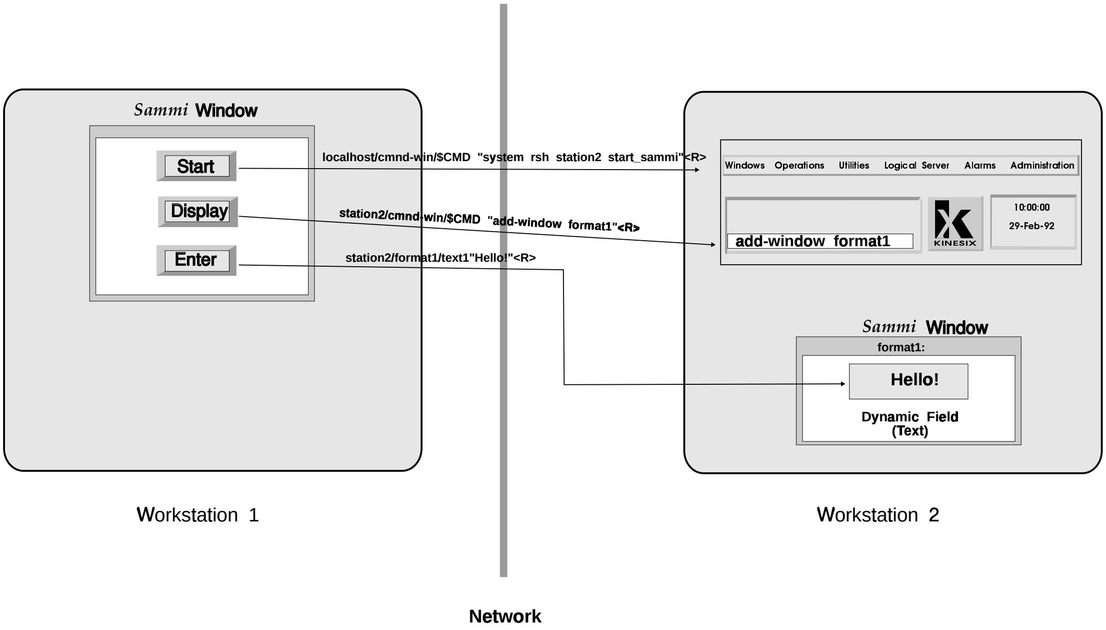
Functions

NOTE: DO NOT use toggle buttons to cause pop-up menus to display; instead use the push buttons for this function.

Internally, the *General Action Button* display type is similar to the *Menu* display type. However, instead of handling a series of functions like menus, each *General Action Button* (GAB) dynamic field is dedicated to a specific function. The specific function performed by each button may vary and may include the following:

- **Issuing commands.** You can use buttons to trigger any *Sammi* command such as **add-window** or **silence-alarm** (see the ***Command Reference*** for a complete list of commands). You can also use buttons to communicate with applications from inside the *Sammi* program.
- **Inserting data.** Any button can be designed to insert a string of text into any enterable field in the current format or any other format.

Each of these functions works by sending a simple string of text characters to the appropriate location and by loading its state and sensitive values in the API buffer. The target location could be *Sammi*, an application, or a dynamic field in the same format or in other formats on the local/remote workstation.


Sammi Window
Start
Display
Enter
localhost/cmnd-win/$CMD "system rsh station2 start_sammi"<R>
station2/cmnd-win/$CMD "add-window format1"<R>
station2/format1/text1"Hello!"<R>
Windows Operations Utilities Logical Server Alarms Administration
add-window format1
KINESIX
10:00:00
29-Feb-92
Sammi Window
format1:
Hello!
Dynamic Field (Text)
Workstation 1
Workstation 2
Network

How Buttons Initiate Actions

In the previous illustration, a series of buttons is used to send different commands and text strings that start *Sammi* on a remote workstation, display a *Sammi* window, and enter data into a dynamic field. Each function specifies a nodename, format name, and/or dynamic field name along with a text string. In most cases, a special flag is included to execute the command, just the way the user presses the RETURN key after entering a command.

Characteristics

General Action Buttons:

- Are allowed in Button Groupings and Radio Boxes. (See the ***General Action Button Grouping*** section in this chapter for details.)
- Use the *Universal Data Access* types to control their *state* (*selected/unselected*, or *on/off*) and whether they are *sensitive* or *insensitive* (*sensitive* accepts events or *insensitive* ignores events and looks grayed-out).
- Send commands.
- Support runtime annotations.

- Have labels that are:

  Text, bitmap, or transparent. *Toggle Buttons* can have two labels, either text or transparent: one for the selected state and one for the unselected state; or four bitmap labels: one for the selected state and one for the unselected state and two additional bitmaps for the insensitive states. If you do not specify a label for a state, the counterpart state's label is used.

  Toggle Buttons can include *indicators* which are small squares (or diamonds on *Mutually Exclusive Radio Buttons)* displayed on the left side of the button area.

  Text labels can be multi-lined and formatted with spacing around the top, bottom, and sides of the text.

Labels

Push buttons can have two labels: Sensitive and Insensitive (whether the button can or cannot be selected, respectively). Toggle-buttons can have four labels: Unselected Sensitive, Selected Sensitive, Unselected Insensitive, and Selected Insensitive. You must use all text or all graphics for these types; you cannot mix text and graphics.

You can use GIF (Graphical Interface Format, GIF87a and GIF89a) and XWD (X-WindowDump) color image labels; the image is scaled to fit the button dimensions. No matter what the size of the graphic, it is scaled to fit the area of the button.

However, `.xbm` graphics are not scaled. An `.xbm` graphic is centered on the button: if it is smaller than the button, the entire graphic is displayed; if larger, the graphic is cut off at the edges of the button.

.sym files shall be stored in the MDB as FWDU_SYMBOL_BITMAP_BINARY End Item.

.**xbm** files shall be stored in the MDB as FWDU_X_BITMAP_BINARY End Item.

.**xwd** files shall be stored in the MDB as FWDU_XWD_BINARY End Item.

.**gif** files shall be stored in the MDB as FWDU_GIF_BINARY End Item.

NOTE: Do not mix `.xbm` graphics with `.gif` or `.xwd` graphics on the same button; scaling and display problems can result.

API information

The API data buffers for the *General Action Button* contain two variables: a *state* variable and a *sensitive* variable. The data type for either variable can be either short or long.

The application can control the sensitivity of a button by setting the *sensitive* data field in the API data buffer. On refresh cycles, the dynamic field checks the *sensitive* field to determine if the button displays grayed-out. Buttons that are tagged as “not sensitive” cannot be selected. An application cannot write state information to a universal toggle button that is insensitive. The application must turn this button sensitive (this can be done in the same write of the state) then turn it insensitive again.

The application can also set the *state* of a button by setting the *state* data field in the API data buffer. On refresh cycles, the dynamic field checks the *state* field to determine whether the button is selected or unselected. When the button is selected/unselected by the user, the button writes its current *state* and *sensitive* values into the API data buffer. This tells the application the button's current condition.

A value of zero for the *state* variable causes the button to be *unselected*. A value of zero for the *sensitive* variable causes the button to be *insensitive* (*unselectable*). Any non-zero values in these variables cause the button to be *selected* and *sensitive*, respectively. Both variables must be of the same data type, either short or long.

You may choose to use neither variable, both variables, or only the state variable with your API application. In order to use the *sensitive* variable, you must use the *state* variable.

The *Number of Values* field on the *Data Access Description* panel must be set to the number of values you expect to use for the General Action Button display type. If you expect only to execute commands, enter zero. If you need to know and control the *state* variable, enter 1. If you need to also know and control the *sensitive* variable, enter 2. See ***Chapter 8*** of this guide for more information.

Runtime annotations

The *General Action Button* display type supports runtime annotations. An application quality value determines the color of the label text and the label's background, and whether the button should blink. Annotated characters are not supported.

Linking to function keys

Normally, buttons are activated when the *Sammi* user clicks the mouse SELECT button on their screen image. However, buttons may also be linked to function keys on the user's workstation, so that the button is activated when the user presses the corresponding key. This only works if the window containing the button has the keyboard focus at the time the user presses the key. Thus, the same key can be used for different buttons in different windows.

To create such a link, enter a local function reference as the *DFD Name* on the *DFD Display* panel. Local function references are constructed by typing a dollar sign ($), the letters `lf`, and an arbitrary number between 00-24. For example:

```
$lf07
```

The local function reference is mapped to a key in the keyboard definitions file `$SAMMI/data/keydefs.dat`. For example, the `keydefs.dat file` could define the F2 key to execute the local function lf07:

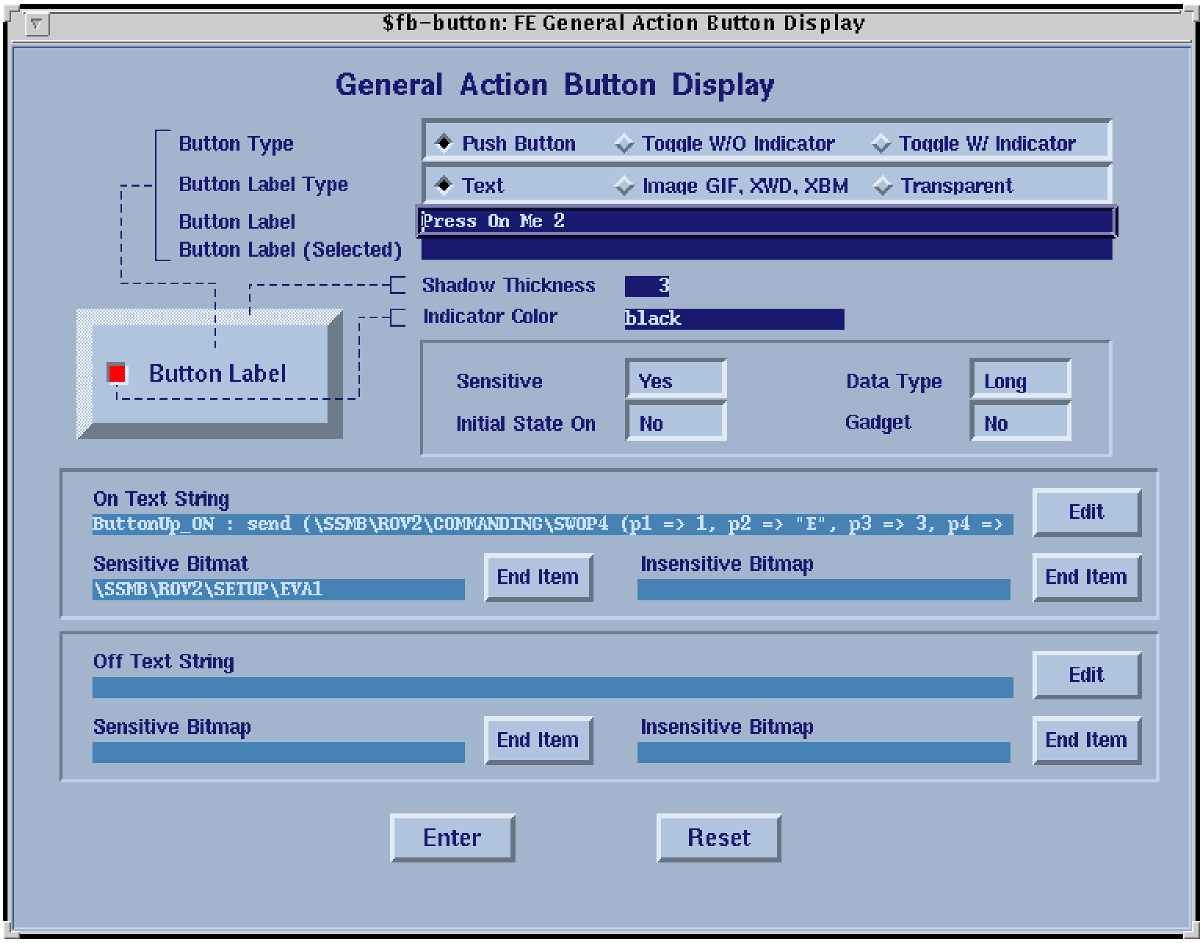
F2 NoSymbol "$lf07"

If the F2 key is pressed, it would have the same effect as if the user clicked on the General Action button DFD whose name is $lf07.

For more information on keyboard definitions, see the ***System Administrator's Guide.***

Display type specifications

Enter the following specifications, as illustrated on the panel below:



$fb-button: FE General Action Button Display

General Action Button Display

Button Type: ● Push Button ○ Toggle W/O Indicator ○ Toggle W/ Indicator

Button Label Type: ● Text ○ Image GIF, XWD, XBM ○ Transparent

Button Label: Press On Me 2

Button Label (Selected):

Shadow Thickness: 3

Indicator Color: black

Sensitive: Yes

Initial State On: No

Data Type: Long

Gadget: No

On Text String: ButtonUp_ON : send (\SSMB\ROV2\COMMANDING\SWOP4 (p1 => 1, p2 => "E", p3 => 3, p4 =>

Sensitive Bitmat: \SSMB\ROV2\SETUP\EVA1

Insensitive Bitmap:

Off Text String:

Sensitive Bitmap:

Insensitive Bitmap:

General Action Button (GAB) Display Entries

Entry Option — **Description**

Button Type

Click the mouse SELECT button on one of the buttons in the box to the right of this field to select a button type (see explanation in the introduction to this section):

Push Button
Toggle W/O Indicator (no indicator)
Toggle W/Indicator (with indicator)

Button Label Type

Click the mouse SELECT button on one of the buttons in the box to the right of this field to select a button label type:

Text
Image GIF, XWD, XBM
Transparent

Button Label

Enter a string for the button's text label; this may be up to 63 characters in length, including new-line characters (`\n`). You may format the label in as many lines as desired. New lines are specified by entering `\n` anywhere in the text label (`\n` when found, is interpreted as a new line and does not print. Double backslash n [`\\n`] is printed as \n). Spacing and margins for the labels are specified as part of the label text.

For example, if you want a margin of 1 character on the top, bottom, and sides of the button label with a two-line label, you would specify the label text as:

```
\n first line of text \n second line of
text \n.
```

General Action Button (GAB) Display Entries (continued)

Entry Option **Description**

Button Label (Selected)

When you select the *Toggle Button W/O Indicator*, you can have two labels: one for the button when it is in an *unselected* state (a raised three-dimensional button if the value in *Shadow Thickness* is greater than zero) and the other for the button when it is in a *selected* state (a pressed three-dimensional button if the value in *Shadow Thickness* is greater than zero).

If you leave this field blank the button will have only one label— the button label from the *Button Label* field, no matter which state the button is in.

Shadow Thickness

If the value in this field is greater than zero, all button types (except transparent) can have a three-dimensional appearance. This field controls the width (in pixels) of the shaded area around the button's borders that creates the three-dimensional look.

These borders use the area within the button; that is, a bigger shadow width does not make the button bigger, rather, the shadow makes less area available for the button label.

Indicator Color

Either enter a color for the indicator color, or select a color by clicking the mouse OPTION button in the field to the right of the *Indicator Color*.

Sensitive

Controls the initial mode of the button. Click the mouse SELECT button in the box to the right of this field to toggle between *Yes*, which means the button is sensitive (accepts events) at startup or *No*, which means the button will be insensitive (ignores events, and a text label is “grayed” or “ghosted out”). If the label is an X bitmap, the insensitive X bitmap is displayed (see ***On/Off /Sensitive/ Insensitive Bitmaps*** entry). Any API application (or server) can override this setting.

General Action Button (GAB) Display Entries (continued)

Entry Option	Description
Initial State On	Controls the initial state of the button. Click the mouse SELECT button in the box to the right of this field to toggle between *Yes*, which means the initial state will be selected, or *No*, which means the initial state of the button will be unselected at startup. The application can override this setting.
Data Type	If the data access type for the button is *Universal*, select the data type by clicking the mouse SELECT button in the box to the right of this field to toggle between the following options: **Long** **Short**
Gadget	Although the *General Action Button* display type is by default a Motif Widget, you can make it a Motif Gadget by setting this field to *Yes*. Gadgets use significantly less memory than Widgets. However, Gadgets have limitations: they have the same foreground and background color as the drawing area they reside on, and the colors you specify in the *DFD Display* will be ignored.

NOTE: To set gadget label colors, enter this line in the `.Xdefaults` file:

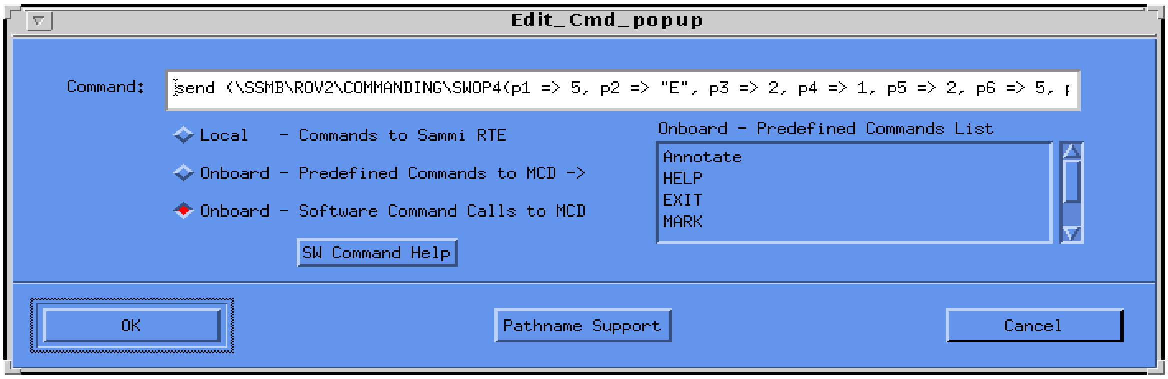
```
SAMMI*XmDrawingArea*foreground: name
```

where name is a color name from ***Appendix A*** of this manual. Gadgets' backgrounds will be a format's background color; the label color (foreground) must be set through Motif via the line above.

General Action Button (GAB) Display Entries (continued)

On/Off Text String

FWDU command send to the runtimesystem/data server. Pressing the Edit button, the following window appears:



Command: send (\SSMB\ROV2\COMMANDING\SWOP4(p1 => 5, p2 => "E", p3 => 2, p4 => 1, p5 => 2, p6 => 5,

○ Local - Commands to Sammi RTE
○ Onboard - Predefined Commands to MCD ->
● Onboard - Software Command Calls to MCD

Onboard - Predefined Commands List
Annotate
HELP
EXIT
MARK

For a detailed description of the Edit_Cmd_popup see “Entering a Command” on page 195.

Sensitive/Insensitive bitmaps

Pathnames to image End Items, which will be displayed on the button.

General Action Button Grouping

Sample Format: *sample_bgroup*

The *General Action Button Grouping* is a manager display type with capabilities encompassing *Mutually-Exclusive Button Grouping* (or *Radio Box*) and *Non-Exclusive Button Grouping*.

A *General Action Button Grouping* display type is comprised of a frame or border surrounding one or more *General Action Button* display types. The *General Action Button Grouping* lets the user select from a mutually-exclusive (radio) or non-exclusive set of functions. The *General Action Button Grouping* display type also provides layout policies (see the ***Packing*** section below). An optional title for the *General Action Button Grouping* can be placed at the top of the grouping.

You can only use *General Action Button* display types defined as toggle types in a *General Action Button Grouping*. Toggle type buttons with and without indicators can be mixed within a grouping. You can create **check boxes** by grouping a set of toggle buttons in a *General Action Button Grouping* and setting the *Radio Grouping* field on the *Button Grouping* display panel to *No*. To create a radio box button group, group a set of toggle buttons in a *General Action Button Grouping* and set the *Radio Grouping* field on the *Button Grouping* display panel to *Yes*.

NOTE: In a radio button group, if a user presses a button that is already pressed, the related command is issued again.

General Action Button display types defined as toggle types, which normally have square-shaped visual indicators, appear with diamond-shaped indicators when grouped into a *General Action Button Grouping* that is set to exhibit Radio behavior. The fact that a *General Action Button* is in a *General Action Button Grouping* is “transparent” to all applications. That is, the application will only be concerned with the individual buttons within the grouping.

Every button grouping on a particular format should have a unique name. If a button grouping is created without a name, management of its buttons is not assured. When the group is named, all buttons within the group are properly managed. Formats may then have more than one independently managed group.

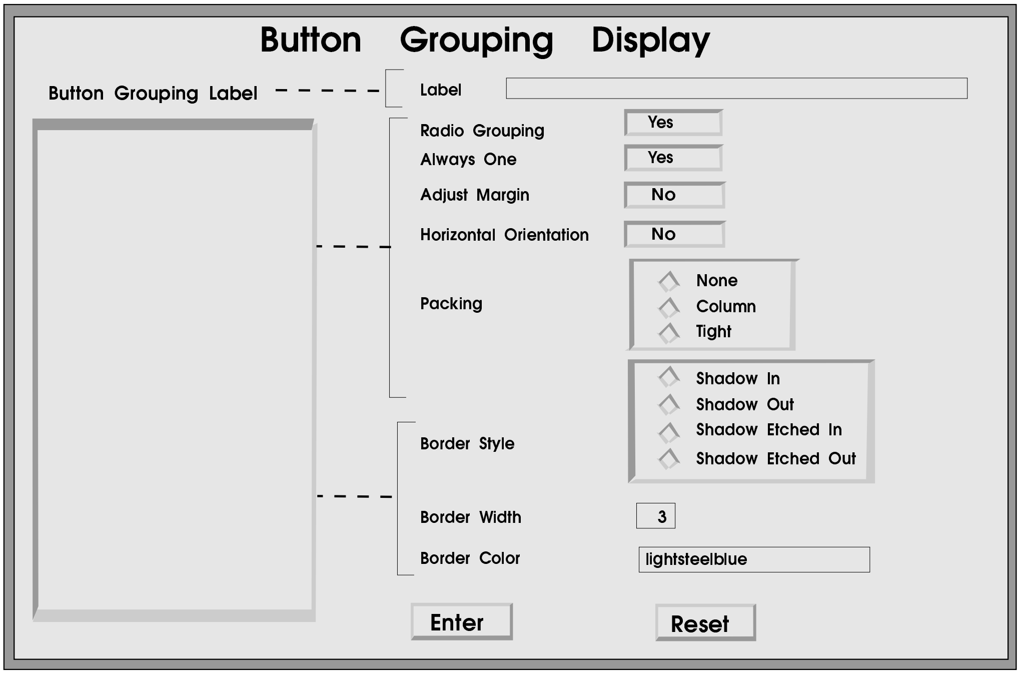
You build *General Action Button Grouping* and *General Action Button* display types in any order and in any location desired. When the *General Action Button Grouping* is displayed during *Sammi* runtime, any *General Action Button* display types defined as toggle type found within the boundaries of the *General Action Button Grouping* display type become members of that *General Action Button Grouping* display type.

You can create the buttons first and then surround them with the *General Action Button Grouping*, or create the *General Action Button Grouping* first and create or move *General*

*Action Button*s into the *General Action Button Grouping*. Similarly, you can delete or move buttons out of the *General Action Button Grouping*. When a *General Action Button* display type is moved out of a *General Action Button Grouping*, it returns to its normal behavior and appearance.

Display type specifications

Enter the following specifications, as illustrated on the panel below:



Button Grouping Display

Button Grouping Label

Label

Radio Grouping: Yes

Always One: Yes

Adjust Margin: No

Horizontal Orientation: No

Packing: ◇ None ◇ Column ◇ Tight

Border Style: ◇ Shadow In ◇ Shadow Out ◇ Shadow Etched In ◇ Shadow Etched Out

Border Width: 3

Border Color: lightsteelblue

General Action Button Grouping Display Entries

Entry Option **Description**

Label

You may specify an optional label for the *General Action Button Grouping*. The optional Text Label may be up to 32 characters in length including “new-line” characters. The display developer may lay out the label in as many lines as desired. New lines are specified by entering `\n` anywhere in the text label (`\n` means a new line and does not print. Double backslash n (`\\n`) is printed as `\n`). Spacing and margins for the labels are specified as part of the label text. For example, if you wanted a margin of 1 character on top, bottom, and sides of the *General Action Button Grouping* label and you wanted a two line label, you would specify the label text as:

```
\n first line of text \n second line of
text \n.
```

General Action Button Grouping Display Entries (continued)

Entry Option	Description
Radio Grouping	If set to *Yes*, the *General Action Button Grouping* enforces Radio behavior on all its members. If set to *No*, toggle type *General Action Buttons* exhibit the same behavior as if they were not included in a grouping.
Always One	If set to *Yes*, the grouping enforces the active radio or toggle button to be selected automatically after having been unselected (if no other radio or toggle button was activated). If set to *No*, the active toggle or radio button may be unselected. This resource is important only when *Radio Grouping* is set to *Yes*.
Adjust Margin	If set to *Yes*, the inner margins of all buttons contained within the *General Action Button Grouping* are forced to the same value. The inner margin corresponds to the button’s top, bottom, left, and right margins.
Horizontal Orientation	A horizontal orientation causes the top and bottom margin for all buttons in a particular row to be forced to the same value; the value is the largest margin specified for one of the buttons. A vertical orientation causes the left and right margin for all buttons in a particular column to be forced to the same value; the value is the largest margin specified for one of the buttons. This keeps all text within each row or column aligned.

General Action Button Grouping Display Entries (continued)

Entry Option **Description**

Packing

Select how to pack the buttons contained within the *General Action Button Grouping*. When the *General Action Button Grouping* packs the buttons it contains, it determines its own major dimension using the value of *Horizontal Orientation* listed above.

None. Indicates that no packing is performed. The x and y coordinates of each button are left alone, and the *General Action Button Grouping* attempts to become large enough to enclose all buttons.

Column. Indicates that all buttons are made with identical sizes. *Sammi* determines the size from the largest height and width values of the individual buttons, and then lays them out in columns.

Tight. Indicates that given the current major dimension (for example, vertical, that is *Horizontal Orientation* is *No*), buttons are placed one after the other until the *General Action Button Grouping* must wrap. *General Action Button Grouping* wraps when there is no room left for a whole button in that row. Wrapping occurs by beginning a new row or column in the next available space. Wrapping continues as often as necessary, until all the buttons are laid out. In the vertical dimension (columns), buttons are set to the same width; in the horizontal dimension (rows), buttons are set to the same length or height. Each button's position in the major dimension is left unaltered (for example, the y coordinate is left unchanged when *Horizontal Orientation* is *No*); its position in the minor dimension is set to the same value as the greatest button in that particular row or column. The position in the minor dimension of any particular row or column is independent of all other rows and columns.

General Action Button Grouping Display Entries (continued)

Entry Option	Description
Border Style	For a border width greater than zero, select a border style by clicking the mouse SELECT button on one of the following buttons in the box to the right of this label: **Shadow In** **Shadow Out** **Shadow Etched In** **Shadow Etched Out**
Border Width	Enter an integer for the width (in pixels) of the border.
Border Color	For a border width greater than zero, either enter a border color, or select the border color by clicking the mouse OPTION button in the box to the right of *Border Color* to display a list of choices.

Graphic Data Field

Sample Format: *sample_gdf*

The *Graphic Data Field DFD* is a display-only DFD with which you can import and manipulate graphical images.

The *Graphic Data Field DFD* supports three graphical data file types:

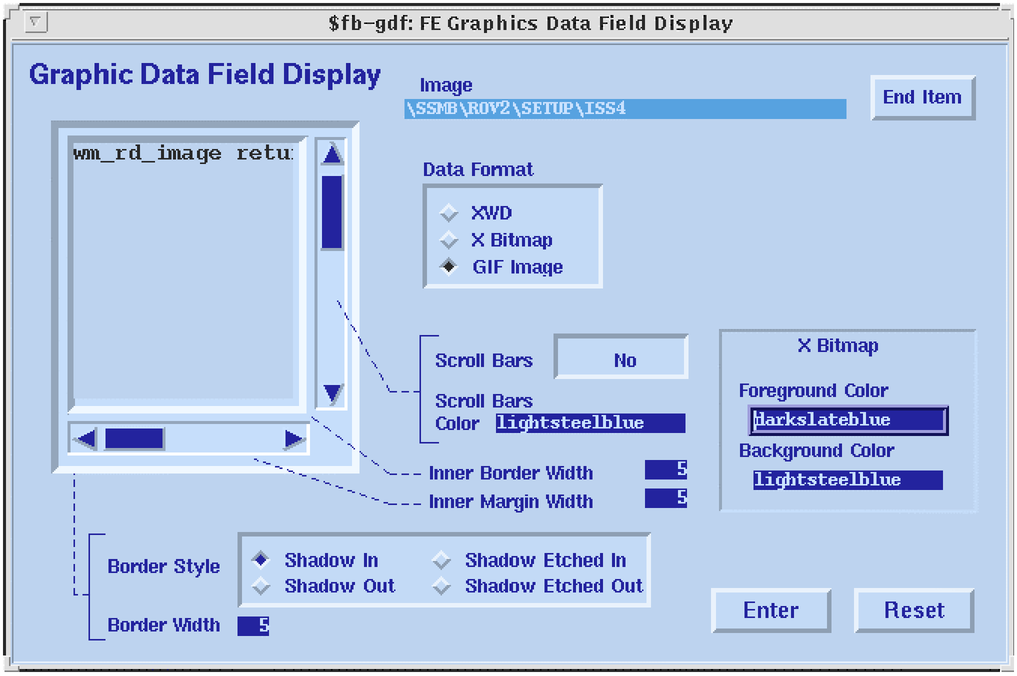
- **X bitmap** (FWDU_X_BITMAP_BINARY End Items), created by the X Window System **bitmap** utility or files that conform to the `xbm` format.
- **X Window Dump** (fwdu_xwd_binary End Items), created with the X Window System **xwd** utility or files that conform to the `xwd` utility format.
- **Graphical Interchange Format** (fwdu_gif_binary End Item), created to conform with the CompuServe Graphical Interchange Format.

For the *Graphic Data Field* DFD, you can:

- Specify the color and style for the border that surrounds the graphic.
- Specify a color for the scrollbars.
- Specify a three-dimensional (3-D) border.
- Specify margins.
- For the X bitmap format, specify the foreground and background colors.

Display type specifications

Enter the following specifications, as illustrated on the panel below:



$fb–gdf: FE Graphics Data Field Display

Graphic Data Field Display

Image: \SSMB\ROV2\SETUP\ISS4

Data Format: ◇ XWD ◇ X Bitmap ◆ GIF Image

Scroll Bars: No

Scroll Bars Color: lightsteelblue

Inner Border Width: 5

Inner Margin Width: 5

X Bitmap

Foreground Color: darkslateblue

Background Color: lightsteelblue

Border Style: ◆ Shadow In ◇ Shadow Out ◇ Shadow Etched In ◇ Shadow Etched Out

Border Width: 5

Graphic Data Field Display Entries

Entry Option	Description
Image	End Item of type FWDU_X_BITMAP_BINARY, FWDU_XWD_BINARY, or FWDU_GIF_BINARY.
Data Format	This field is set automatic when you enter an End Item in the image field.

Graphic Data Field Display Entries (continued)

Entry Option — **Description**

Scrollbars

Select whether scrollbars are to be added to the DFD by clicking the mouse SELECT button in this box to toggle between:

As Needed. If the graphic is larger than the area of the DFD, scrollbars are automatically added to the DFD.

No. No scrollbars are used, no matter what the size of the graphic. Clip the image to fit the DFD.

Scrollbars Color

If you selected *As Needed* for Scrollbars, either enter a color for the scrollbars, or click the mouse OPTION button in the box beside this label to display an option list. Then click on the desired color name with the mouse SELECT button.

Inner Border Width

Enter the integer number in pixels for the inner border width. This is the width of the shadow around the actual graphic. Enter zero (0) for no inner border.

Inner Margin Width

Enter the integer number in pixels for the inner margin width. This is a margin inside the border that is left blank.

Border Style

For a border width greater than zero, select a border style by clicking the mouse SELECT button on one of the following buttons in the box to the right of this label:

Shadow In
Shadow Out
Shadow Etched In
Shadow Etched Out

Border Width

Enter the integer number of pixels for a border width. Enter zero (0) for no border.

Graphic Data Field Display Entries (continued)

Entry Option **Description**

X Bitmap Only

Foreground Color For X bitmap data type, either enter a color for the foreground, or click the mouse OPTION button in the box below this label to display an option list. Then click on the desired color name with the mouse SELECT button.

Background Color For an X bitmap data type, either enter a color for the background, or click the mouse OPTION button in the box below this label to display an option list. Then click on the desired color name with the mouse SELECT button.

Graphs (Plot and Trend)

Sample Formats: *sample_plot, sample_trend*

The *Plot* and *Trend* display types display graphs containing up to 256 simultaneous curves. Both of these display types are virtually identical except for the type of data they handle. *Plot* is used to compare sets of incoming data values to each other, while *Trend* is used to examine the changes in data values over time.

Correspondingly, *Plot* expects to receive sets of real numbers from an API data server, while *Trend* expects to receive a long time number and corresponding real values.

A separate curve and y scale are shown for each existing y value, provided the y scales are different.

There can be, for example, a plot of two y values (flow and temperature) and a single x value (pressure). The two resulting curves show variations in flow and temperature as pressure increases.

There might be two scales for the y axis, one for each curve (color coding helps the *Sammi* user see which scale belongs to which curve).

There are a variety of specifications you can enter for a plot or trend graph, detailed in the following sections.

General

On a general level, you can specify the graph title and color as well as the background color and grid. For the grid, you can choose the color, the type (dots or lines), and the spacing (grid lines at major or minor tick marks). You can use any printable character as the line marker. To specify such a character, enter the character into the Line Marker field on the relevant display panel, surrounded by single quotes in line marker style definition (e.g. ’S’).

WARNING: Plots and Trends DO NOT update when the OPTIONS pop-up is displayed (for zooming functions, etc.); incoming data points are lost during this time.

X & Y Axis

For the x axis, you can specify the title and title color. You can also specify the minimum/maximum values and color to be used for the scale. *Sammi* draws the tick marks and adds the appropriate scale labels. If you do not select specific minimum/maximum values, *Sammi* resets the scale to the data range each time a set of points is received.

You can use sub-second trend ranges; *Sammi* uses double precision to manipulate the X-axis range, which you can then specify to less than 1 second. You can specify this

X-axis range using the Format Editor, `change-dfd-attribute` command, or the zoom-scroll dialog.

For the y axis, you can specify the same features as for the x axis. To enter information for each individual y axis, click the mouse SELECT button on the *Curve Definition* button of either the *Plot* or *Trend Display* panel to show the *Line Chart Variables Display* panel.

For each value plotted on the y axis, you can choose whether to draw an actual curve or “suppress” drawing of the curve to produce a scatter plot effect. You can also choose the type of marker to be used on each curve to show data points (box, triangle, cross, etc.). If any curves share the same y scale range, only one scale will be drawn. This scale will have the color of the highest number curve.

NOTE: Axis labelling is done with a predefined font that scales as the graph is resized. The use of a predefined font means the font specifications in the DFD Display panel is ignored.

Sizing

Sammi sizes both *Plot* and *Trend* displays to fit the area covered by the dynamic field. However, a certain amount of space along the top, left, and bottom of the dynamic field is always reserved for labelling and scales. The rest is filled proportionally with the graph. If the dynamic field is too small, there may not be enough room for all the elements, or there may be barely enough room to draw the graph.

When creating a plot or trend, therefore, make sure the dynamic field is optimally sized to produce the best display.

Zoom

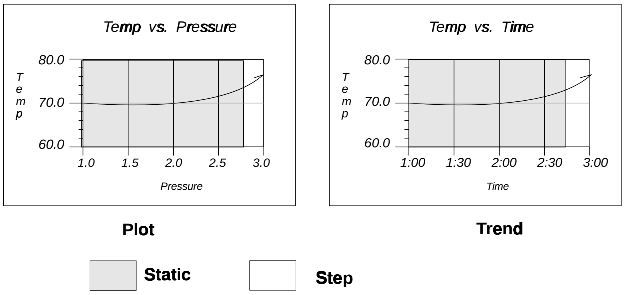
A zoom by bounding box feature allows the user to interactively define an area on a plot or trend during runtime, which is then zoomed. The user must click the mouse button (MB) 2 to start the bounding box, then drag open the box to enclose the desired area and click MB 2 again when the box is the desired size. The selected area is zoomed and displayed in the graph-zoom popup window or locally inside the plot/trend. Refer to the **graph** command in the ***Command Reference*** to set the desired graph zoom type.

Double-buffering

This option draws a plot or trend to a temporary buffer, then copies that buffer to the screen once the drawing is done; this greatly reduces screen flicker. The tradeoff is that this uses more memory.

Step Display/Step Fraction

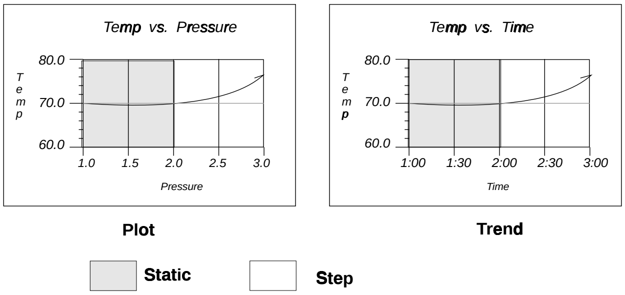
If you set the *Display Mode* for a plot or trend to *Step Display*, the default *Step Fraction* is .2. This means that either 20% of the *Span* (for *Trends*) or 20% of the display between the X min and X max (for *Plots*) is refreshed at a time while the remaining 80% is retained.



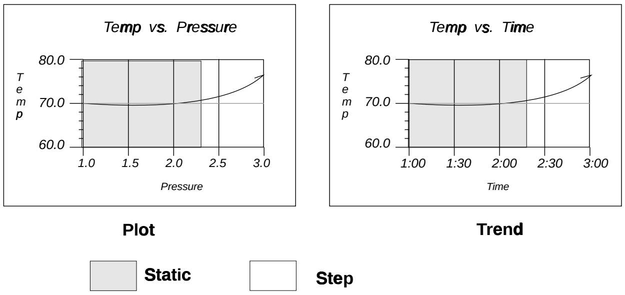
Step Display with Step Fraction Set At .2

Entering .5 sets the two parts of the display to equal size. Entering .33 sets the display to 1/3 for the *Step Fraction* and 2/3 for the static fraction. Entering 0 causes the default of 20%. Entering 1.0 causes entire display to refresh.

See the following illustrations for examples.



Step Display with Step Fraction Set At .5



Step Display with Step Fraction Set At .33

For plots and trends set to *Step Fraction*, the span does not represent the actual X range you will see. Instead, the actual X axis range that will be displayed is calculated by this formula:

range = span/(1-step)

For example, with a span of 100 and a step of 0.5, 200 points will be displayed. For a span of 100 and a step of 0.8, 125 points will be displayed.

Individual curve specifications

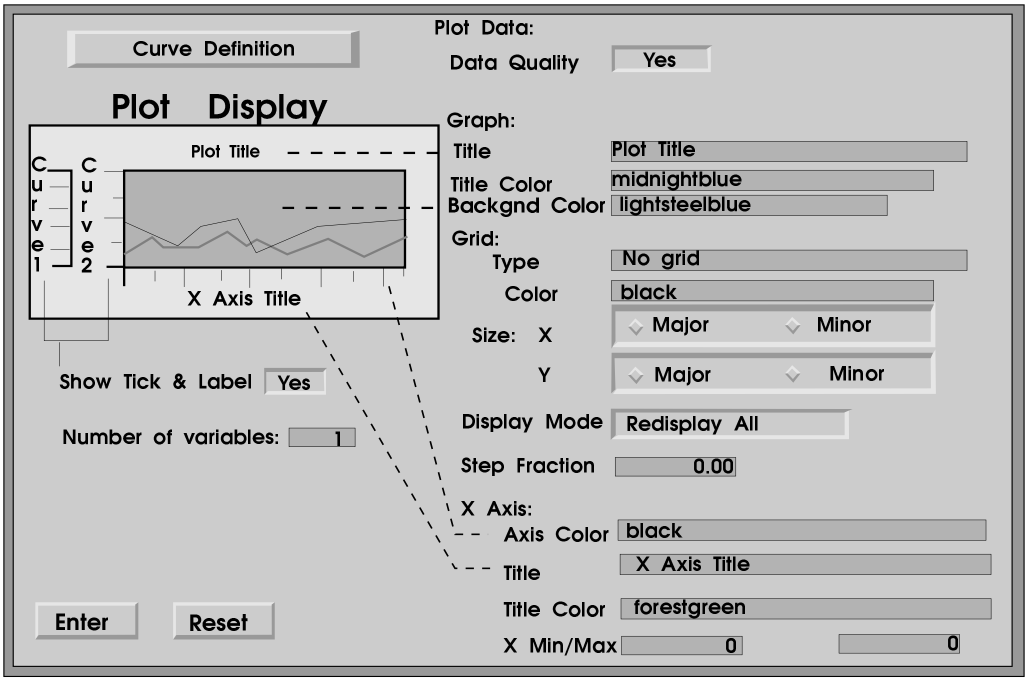
Using the Line Chart Variables Display panel, available from either the plot or trend display panel, you can set variables for each individual curve.

API information

The *Sammi* user can set some attributes of the *Plot* and *Trend* display types during runtime with the **change-dfd-attributes** command. The command can be issued by a *Sammi* user on the command line of the *Sammi* Command window (see the ***Command Reference)***. This command can also be sent by an application.

Plot display type specifications

Enter the following specifications, as illustrated on the panel below. To enter information for individual curves, click on the *Curve Definition* button. (For more information, refer to the ***Line Chart Variables Display specifications*** section later in this chapter).



Plot Data:
Data Quality: Yes

Graph:
Title: Plot Title
Title Color: midnightblue
Backgnd Color: lightsteelblue

Grid:
Type: No grid
Color: black
Size: X ◇ Major ◇ Minor
Y ◇ Major ◇ Minor

Display Mode: Redisplay All
Step Fraction: 0.00

X Axis:
Axis Color: black
Title: X Axis Title
Title Color: forestgreen
X Min/Max: 0 0

Show Tick & Label: Yes

Number of variables: 1

Plot Display Entries

Entry Option	Description
Show Tick & Label	Click the mouse SELECT button to the right of this label to toggle between *Yes* and *No*, selecting whether to display tick marks, labels, and titles.
Number of Variables	Display only-the value for this field is calculated after you define the variables on the *Line Chart Variables Display* panel.
Data Quality	Use this field to allow certain runtime annotations, blinking, or color changing (see the ***Runtime annotations*** section earlier in this chapter). Click the mouse SELECT button on the button to the right of this field to toggle between *Yes* and *No*. The API programmer must know this setting in order to provide the correct number of variables.

Plot Display Entries (continued)

Entry Option **Description**

Graph

Title

Enter the text for the graph title. *Sammi* uses scalable fonts for Plot and Trend labels, allowing titles and labels to be resized appropriately if the plot/trend is zoomed. *Sammi* automatically switches from fixed-size fonts to scalable fonts when a screen is resized by more than 10%.

Title Color

Either enter a color for the graph title color, or click the mouse OPTION button in the box beside this label to display an option list. Then click the mouse SELECT button on the desired color name.

Backgnd Color

Either enter a color for the background of the graph (inside the axes), or click the mouse OPTION button in the box beside this label to display an option list. Then click the mouse SELECT button on the desired color name.

Grid

Type

Select the type of grid by clicking the mouse SELECT button in the box beside this label to select one of the options from the following list of valid entries:

No grid
Dotted horizontal grid lines
Solid horizontal grid lines
Solid vertical grid lines
Solid vertical and horizontal grid lines

Color

Either enter a color to be used for grid lines, if any, or click the mouse OPTION button in this box to display an option list. Then click the mouse SELECT button on the desired color name.

Size

X

Click the mouse SELECT button in this group to select either *Major* or *Minor* tick marks for the X axis.

Y

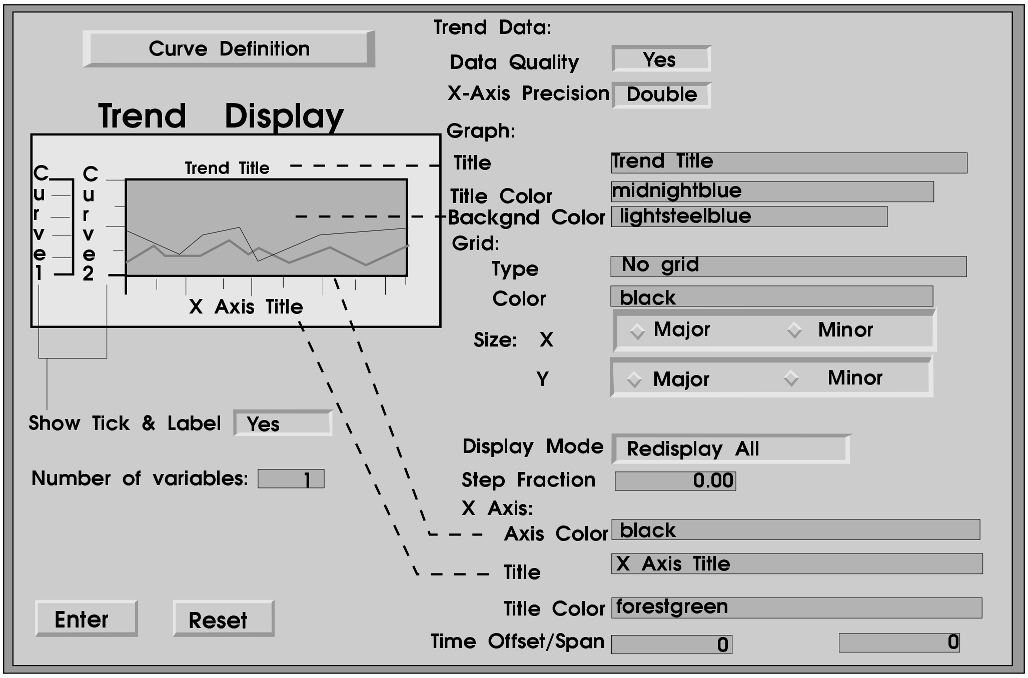
Click the mouse SELECT button in this group to select either *Major* or *Minor* tick marks for the Y axis.

Plot Display Entries (continued)

Entry Option	Description
Display Mode	Click the mouse SELECT button to the right of this label to toggle between *Step Display* and *Redisplay All*. The *Redisplay All* option always displays 100 percent of the plot.
Step Fraction	For *Step Display* mode only, enter a value that represents how much new data is used to refresh the *Step Fraction* part of the display (please refer to ***Step Display/Step Fraction*** earlier in this section for details).
X Axis	
Axis Color	Enter the color of the x axis itself, or click the mouse OPTION button in the box beside this label to display an option list. Then click the mouse SELECT button on the desired color name.
Title	Enter the title to be displayed along the x axis.
Title Color	Enter the color of the x axis title, or click the mouse OPTION button in the box beside this label to display an option list. Then click the mouse SELECT button on the desired color name.
X Min/Max	Enter the minimum/maximum x axis values.

Trend display type specifications

Enter the following specifications, as illustrated on the panel below. To enter information for individual curves, click on the *Curve Definition* button. (For more information, please refer to the ***Line Chart Variables Display specifications*** section later in this chapter):



Trend Data:
Data Quality: Yes
X-Axis Precision: Double
Graph:
Title: Trend Title
Title Color: midnightblue
Backgnd Color: lightsteelblue
Grid:
Type: No grid
Color: black
Size: X ◇ Major ◇ Minor
Y ◇ Major ◇ Minor
Show Tick & Label: Yes
Number of variables: 1
Display Mode: Redisplay All
Step Fraction: 0.00
X Axis:
Axis Color: black
Title: X Axis Title
Title Color: forestgreen
Time Offset/Span: 0 0

Trend Display Entries

Entry Option — **Description**

Show Tick & Label

Click the mouse SELECT button on the button to the right of this field to toggle between *Yes* and *No*, selecting whether to display tick marks, labels, and titles.

Number of Variables

Display only- the value for this field is calculated after you define the variables on the *Line Chart Variables Display* panel. (To access this panel, click the mouse SELECT button on the *Curve Definition* button.)

Data Quality

Use this field to allow certain runtime annotations, blinking, or color changing (see the ***Runtime annotations*** section earlier in this chapter). Click the mouse SELECT button on this button to toggle between *Yes* and *No.* The API programmer must know this setting in order to provide the correct number of variables.

Trend Display Entries (continued)

Entry Option **Description**

X-Axis Precision

Click the mouse SELECT button on the button to the right of this field to select either *Single* precision for time in seconds or *Double* precision for time in seconds and microseconds.

Graph

Title

Enter the text for the graph title.

Title Color

Either enter a color for the graph title color, or click the mouse OPTION button in the box beside this label to display an option list. Then click the mouse SELECT button on the desired color name.

Backgnd Color

Either enter a color for the background of the graph (inside the axes), or click the mouse OPTION button in the box beside this label to display an option list. Then click the mouse SELECT button on the desired color name.

Grid

Type

Select the type of grid by clicking the mouse SELECT button in the box to the right of this field to select one of the options from the following list of entries:

No grid
Dotted horizontal grid lines
Solid horizontal grid lines
Solid vertical grid lines
Solid vertical and horizontal grid lines

Color

Either enter a color to be used for grid lines, if any, or click the mouse OPTION button in this box to display an option list. Then click the mouse SELECT button on the desired color name.

Trend Display Entries (continued)

Entry Option **Description**

Size

X Click the mouse SELECT button in this group to select either *Major* or *Minor* tick marks for the X axis.

Y Click the mouse SELECT button in this group to select either *Major* or *Minor* tick marks for the Y axis.

Display Mode Click the mouse SELECT button in the box to the right of this field to toggle between *Step Display* and *Redisplay All*. The *Redisplay All* option always displays 100 percent of the trend.

Step Fraction If you select the *Step Display* mode, enter a value that represents how much new data is used to refresh the *Step Fraction* part of the display (please refer to ***Step Display/ Step Fraction*** earlier in this section for details).

X Axis

Axis Color Enter the color of the x axis itself, or click the mouse OPTION button in this box to display an option list.

Title Enter the title to be displayed along the x axis.

Title Color Enter the color of the x axis title, or click the mouse OPTION button in this box to display an option list.

Time Offset/Span Enter the starting *Time Offset* and *Span* (both are measured in seconds). The *Time Offset* value is the number of seconds back in time from the current time to use as the starting time of the x axis. The *Span* value is the number of seconds displayed along the x axis. *Sammi* uses these values as the upper and lower limits of the x axis and adds appropriate tick marks and labelling between these points along the x axis.

NOTE: If you set the *Time Offset* value to zero and the *Span* value to a positive value**,** the Runtime Environment initializes the starting value to the first point received and then automatically scrolls the trend graph to the right as the values received exceed the *Span* value.

Line Chart Variables Display specifications

Enter the following specifications for individual curves, as illustrated on the panel below. Click on the *Curve Definition* button of either the *Plot* or the *Trend Display* panel to display this panel.

To add a variable, click on the *Add Variable* button, then enter information for the variable in the appropriate fields. Once you have entered information for a variable, either press the Return key or click the mouse SELECT button on the *Enter* button.

Add a variable to the middle of an existing list of variables by either:

- Clicking the mouse SELECT button on the variable name just above where you want to add a new variable and then clicking the mouse SELECT button on the *Add Variable* button.

- Clicking the mouse SELECT button on the *Add Variable* button, then typing in the desired *Curve Position.*

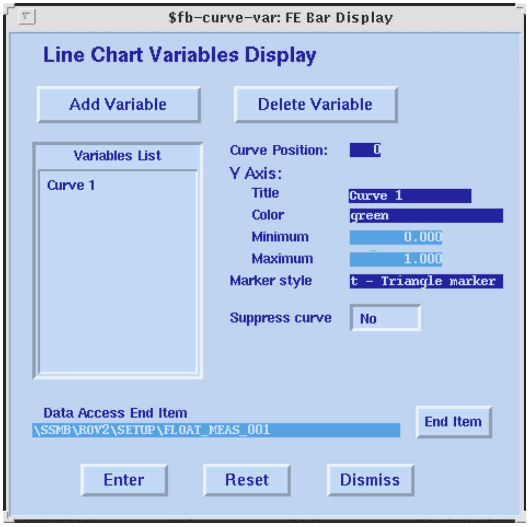
In either case, the *Curve Position* field for all variables that follow the added one are automatically updated; the variable list is sorted in *Bar Position* order.

To change a variable, click the mouse SELECT button on the name in the *Variables List,* then make the desired changes.

To delete a variable, click the mouse SELECT button on the name in the *Variables List*, then click the mouse SELECT button on the *Delete Variable* button.

If you click on the *Delete Variable* button without highlighting a variable in the list, the variable at the end of the list is deleted.

When you have added and saved all the variables (by pressing the Return key or clicking the mouse SELECT button on Enter), close this panel by clicking on the *Dismiss* button.



$fb-curve-var: FE Bar Display

Line Chart Variables Display

Variables List: Curve 1

Curve Position: 0

Y Axis:

Title: Curve 1

Color: green

Minimum: 0.000

Maximum: 1.000

Marker style: t - Triangle marker

Suppress curve: No

Data Access End Item: \SSMB\ROV2\SETUP\FLOAT_MEAS_001

Line Chart Display Entries

Entry Option **Description**

Y Axis

Title Enter the title to be used for the y axis scale.

NOTE: Each curve defined must have a y axis title in order for *Sammi* to recognize the curve definition.

Color Either enter the color to be used for this y axis title, scale, and curve, or click the mouse OPTION button in this box to display an option list. Only one color is entered for each title/scale/curve, so the user will be able to see at a glance which curve goes with which scale.

NOTE: If two or more curves share the same scale, the color of the highest number curve is used for the scale.

Data Access End Item Here you specify a measurement End Item per curve. (example is of type demo_egse_float_measurement End Item).

Minimum and Maximum Value Read-Only. Is read from the End Item Engineering Range's High and Low Values.

Line Chart Display Entries (continued)

Entry Option | **Description**

Marker Style

Select the type of marker to be used for data points in each curve. Click the mouse SELECT button in this box to select one of the following options:

No marker
Box
Triangle
Cross Hair
Lines To Axes
Crosspoint Marker
X-shaped Marker

NOTE: If none of the above options is desired, the user may enter any printable character, surrounded by single quotes, in this field.

Suppress Curve

Click the mouse SELECT button in this box to toggle between *Yes* (to produce a scatterplot, which leaves the data points unconnected) and *No* (to produce a curve; *Sammi* will draw a visible curve through each set of data points).

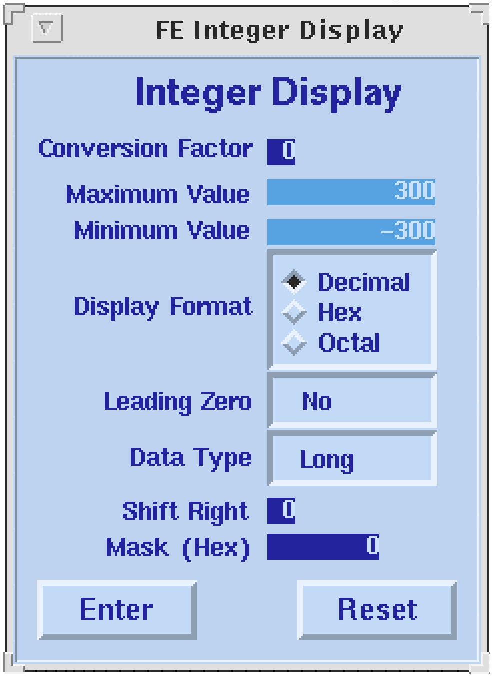
Integer

Sample Format: *sample_litrl*

The *Integer* display type shows and accepts whole numbers from the user or an application.

Display type specifications

Enter the following specifications, as illustrated on the panel below:



FE Integer Display

Integer Display

Conversion Factor 0

Maximum Value 300

Minimum Value -300

Display Format ◆ Decimal ◇ Hex ◇ Octal

Leading Zero No

Data Type Long

Shift Right 0

Mask (Hex) 0

Integer Display Entries

Entry Option	**Description**
Conversion Factor	Select a conversion code for incoming data (see ***Appendix F*** for details).
Maximum/Minimum Value	Read-only. These values are Engineering range High Value and Engineering range Low Value, automatic taken from the specified measurement End Item in $fb-uni.
Value	Enter the minimum value allowed for user entry, if such input is allowed; zero indicates no limit.

Integer Display Entries (continued)

Entry Option **Description**

Display Type

Select the format in which you want the integer value to display. Click the mouse SELECT button on one of the three options:

Decimal (base 10)
Hex (base 16)
Octal (base 8)

Leading Zeros

Click the mouse SELECT button to toggle between *Yes*, to display leading zeros, or *No*, to not display leading zeros.

Data Type

Select the type of integer value you want displayed. Click the mouse SELECT button on the field to toggle between the following options:

Short
Long

Shift Right

For certain applications where you want to isolate specific bits in a data value, enter the number of bits to shift right. For more information, see ***Appendix G Shifting and Masking.***

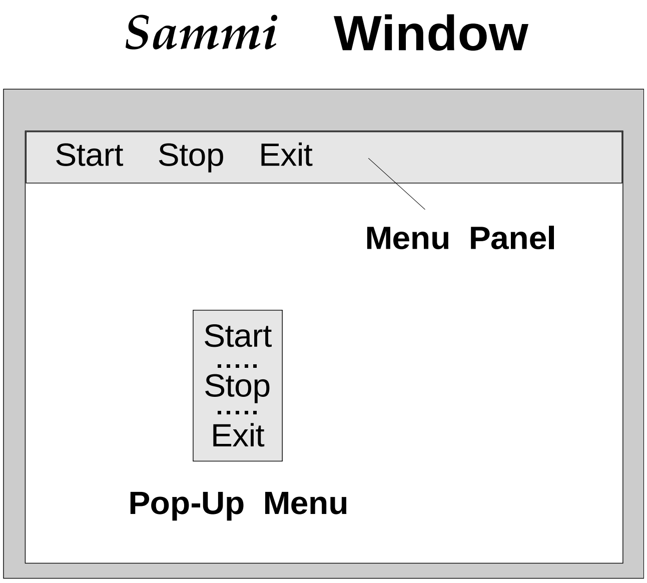
Mask

For certain applications where you want to isolate specific bits in a data value, enter the mask value to apply to the data value after shifting. For more information, see ***Appendix G Shifting and Masking.***

Menu

Sample Format: *sample_menu*

The *Menu* display type defines either a pop-up menu or a menu panel, as shown in the illustration below. The menu panel appears as a fixed bar across the top of the *Sammi* window, while a pop-up menu appears only when the user clicks the mouse OPTION button anywhere inside the window. Both types of menus perform the same functions; use the type most suitable to your purposes.



Typically, menus can be dedicated to any of the following functions:

- **Issuing *Sammi* commands.** Menu options can be designed to trigger any *Sammi* command (**add-window**, **silence-alarm**, etc.), including the *Sammi* **system** command which can be used to start external applications and issue operating system commands. See the ***Command Reference*** for a list of all commands.

- **Issuing application-specific commands.** Menu options can be designed to communicate with applications from within the *Sammi* program.

- **Inserting data.** Any menu option can be designed to insert a string of characters into any data field on a format.

Each of these functions works by sending a simple character string to the appropriate location. As discussed above, the target location could be *Sammi*, an application, or a dynamic field in the same format or other formats located on either a local/remote workstation.

When completing the *DFD Display* panel for this display type (refer to ***Chapter 6*** for details), the *DFD Name* must be set as $MAINMENU to produce a pop-up menu or $MAINPANEL to produce a menu panel. Since these two names are reserved, you can create only one of each type on a single format.

It does not matter how you size or position the dynamic field on a format. The final size and positioning of the menu is controlled by the Runtime Environment.

A pop-up menu does not take up any space in the final *Sammi* window since it is invisible until the *Sammi* user clicks the mouse OPTION button. When it does appear, it overlays other window components temporarily and is sized as large as it needs to be to show all options.

A menu panel always appears at the top of the *Sammi* window and takes up an amount of space that is *in addition to* the specified height of the format. Since a menu panel is limited to the width of a format, creating a menu panel with numerous options may cause the menu options to take up more than one line. To fit all options onto one line, try making the format wider, reducing the number of options, or using shorter item names in the menu.

Menus used as options

Another use of the *Menu* display type is as a pop-up option list for other display types, such as *Object Icon*. When the user clicks on the other dynamic field with the mouse OPTION button, the Menu display type pops up.

When you attach the Menu display type to another dynamic field, that field becomes the “trigger DFD”, since it causes the pop-up action. When used in this way, the popup *Menu* ALWAYS "grabs" input, even if you specify "Grab Focus = NO" when you create the *Menu*.

When used as a pop-up option, the *Menu* display type can be either a:

- **Command Option** that sends a command and/or “button events” to an application. The menu is attached to the “trigger DFD” by entering the *Menu* name in the *Option DFD Name* field and toggling the *Cmnd* field to *Yes* on the *DFD Display* panel for the “trigger DFD”.

  or

- **Character I/O Option** that places a value in the “trigger DFD.” The menu is attached to the “trigger DFD” by entering the *Menu* name in the *Option DFD Name* field and toggle the *Cmnd* field to *No* on the *DFD Display* panel.

  For a *Menu* used as **Character I/O Option**, any entries in the *Logical Server*, *Format Name*, and *DFD Name* fields are ignored; it is not necessary to enter them. This type of menu places a character string in the "trigger DFD."

In either case, the *Menu* does not pop up unless the user has write privileges for the format and “trigger DFD.” (See the ***System Administrator’s Guide*** for more information on security.)

Command entries for menus used as options

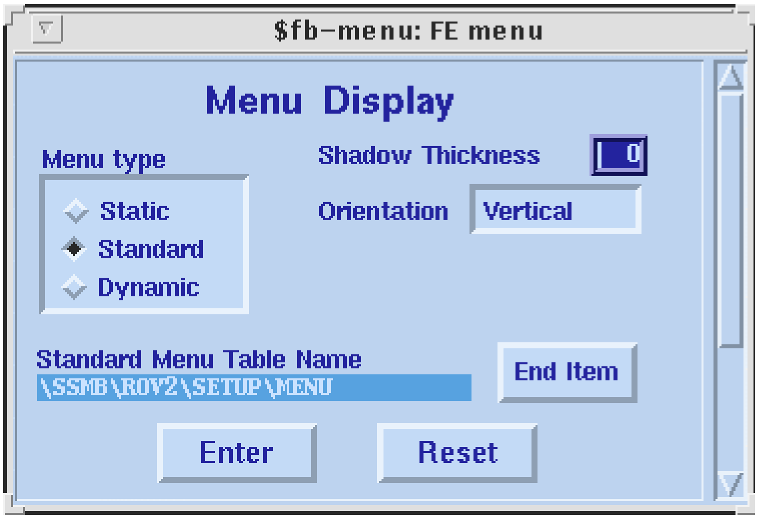
For a *Menu* used as a **Command Option**, which pops up when the mouse OPTION button is clicked in a trigger dynamic field, the presence (or absence) of the logical server name causes different actions:

- If a logical server name is present, the command entries associated with the selected item are sent to the specified server. If the logical server is an application, the server is notified that the command data for the selected item is available with the `S2_SEND_CMD` event within the application. If entry in the logical server name is `$local-cmd`, the command items are sent to the *Sammi* Command processor.

- If there is no entry in the *Logical Server Name* field of the *Static Menu* in the *Menu Definition* panel, the logical server of the “trigger DFD” is notified that the command data for the selected item is available with the `S2_BTN_EVENT` event in the application. In this case, if the “trigger DFD” is not connected to a server, the commands associated with the selected item are discarded.

Display type specifications

Enter the following specifications, as illustrated on the panel below:



$fb–menu: FE menu

Menu Display

Menu type

○ Static
● Standard
○ Dynamic

Shadow Thickness 0

Orientation Vertical

Standard Menu Table Name
\SSMB\ROV2\SETUP\MENU

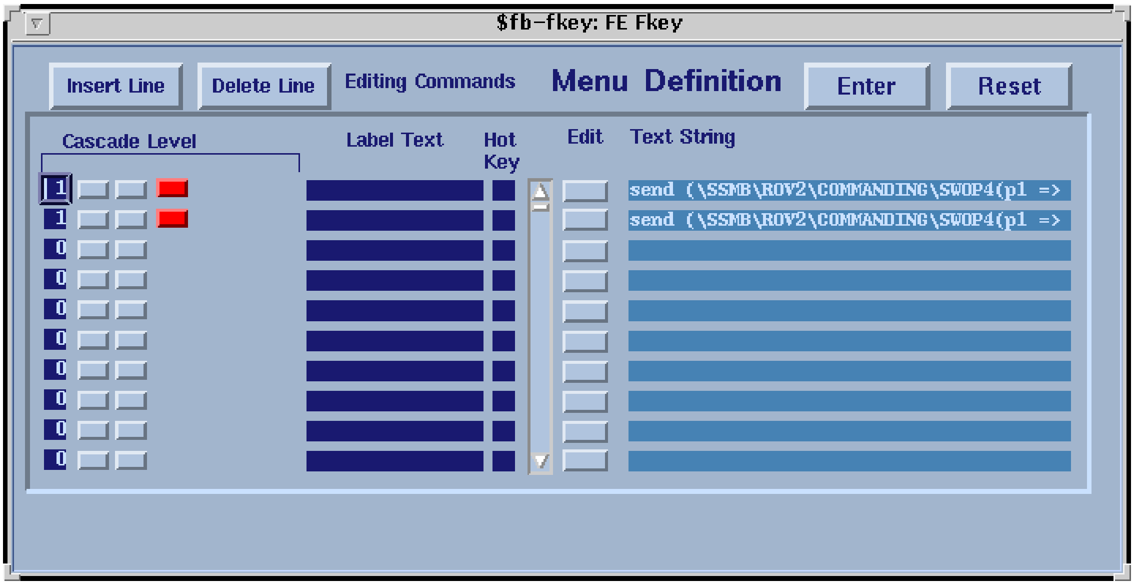
Menu Display Entries

Entry Option	Description
Menu Type	Click the mouse SELECT button on one of the buttons in this box to select one of the following menu types: **Static.** Define the menu elements and commands using the *Menu Definition* panel, which displays next if you select this type. **Standard.** Define a “Standard Menu Table” whose elements and commands are included in the command file. (See ***Appendix C*** for information on creating this table.) **Dynamic.** An application sends the menu elements and commands for this type.
Standard Menu Table Name	End Item of type fwdu_list_text
Shadow Thickness	Enter an integer for the number of pixels used for the shadow thickness; a zero means no shadow.
Orientation	Click the mouse SELECT button in this box to toggle between: **Vertical.** For each level, stack the menu items one on top of each other in a single row. **Horizontal.** Place the menu items one after the other from left to right in a single row.

Static menu display type specifications

If you select the *Static Menu Type*, enter the following specifications in the *Menu Definition* panel. You must complete one set of the following entries for each option on the menu you are creating.

NOTE: Menu fonts/colors are controlled by default settings in the *DFD Display* panel.



Cascade Level	Label Text	Hot Key	Edit	Text String
1				send (\SSMB\ROV2\COMMANDING\SWOP4(p1 =>
1				send (\SSMB\ROV2\COMMANDING\SWOP4(p1 =>
0				
0				
0				
0				
0				
0				
0				
0				

Menu Definition Entries (continued)

Entry Option **Description**

Cascade Level

You must set a *cascade level* for all menus. Enter a value starting at one. The value is one more than the actual number of levels to create the next cascade level. A value of zero signifies the last entry for the menu. An empty entry on the same level is used as a separator (blank line) between items on the same level. You can use the left and right arrows to change the level.

Label Text

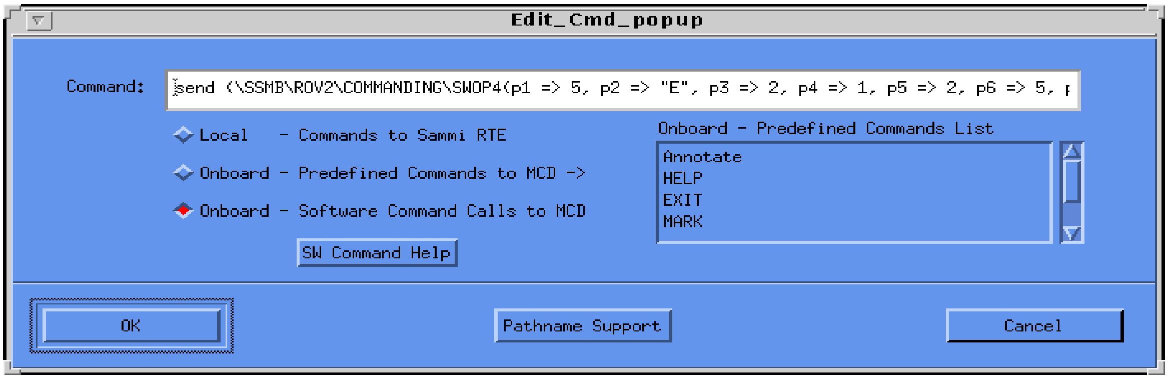
Enter the text that will display on the menu for each option. If this is a menu panel and you do not enter a logical server or a DFD name, the text will be centered on the panel. If you enter a logical server or a DFD name, the text will be left-justified.

Hot Key

Specify a “hot key” for each menu item. The “hot key” is used as direct keyboard access to a menu item. Enter the ASCII keyboard equivalent to the key that you want defined as the “hot key.” Hot keys do not work with Cascade Level 1.

Text String

FWDU command send to the runtimesystem/data server. Pressing the Edit button, the following window appears:



Edit_Cmd_popup

Command: send (\SSMB\ROV2\COMMANDING\SWOP4(p1 => 5, p2 => "E", p3 => 2, p4 => 1, p5 => 2, p6 => 5, p

○ Local - Commands to Sammi RTE
○ Onboard - Predefined Commands to MCD ->
● Onboard - Software Command Calls to MCD

For a detailed description of the Edit_Cmd_popup see “Entering a Command” on page 195.

NOTE: Edit only via Edit button!

Standard menu

You can enter menu specifications into a command file (.`cmd`) by using an ASCII editor to create a Standard Menu Table and then selecting *Standard* as the *Menu Type* from the *Menu display* panel. (For more information on command files, see ***Appendix C***

Standard Command File).

The hot key specification is not supported in the Standard Menu command file.

Dynamic menu

Menu specifications can be sent to the *Menu* display type from an application. When the *Menu Type* in the *Menu* display panel is set as *Dynamic*, and you click the mouse SELECT button on the *Enter* button, the *Universal Data Definition* panel displays.

Set the *Number of Values* field in this panel to the maximum number of entries that the menu can ever contain (see ***Chapter 8*** for information about this panel).

NOTE: The *Data Access Type* in the *DFD Display* panel must be set to *Universal* for *Dynamic* menu specification (see ***Chapter 6***).

Meter/Gauge

Sample Format: *sample_meter*

The *Meter* and *Gauge* display types are *Sammi*-based representations of analog devices which use a needle to point to the current data value. These display types are virtually identical except for their shapes: a *Meter* appears as a square device while a *Gauge* appears as a round one. Both real numbers and integers are acceptable incoming data for this display type.

Sammi scales both display types to fit the area defined by the dynamic field. When creating a meter or gauge, therefore, you can make the dynamic field virtually any size.

If the meter or gauge is less than 100 pixels by 100 pixels, the image may not be displayed correctly. Any text portion of the image may overwrite the graphic part of the image or not display at all.

You will enter the same set of specifications for *Meter* and *Gauge*. You can specify colors for the body, dial background, scale tick marks, needle, and labels. You can also set the minimum and maximum values for the needle scale, the increment values for the tick marks, and indicate whether to display them or not.

You can also add several features to make the display more helpful to the user. For example, you can:

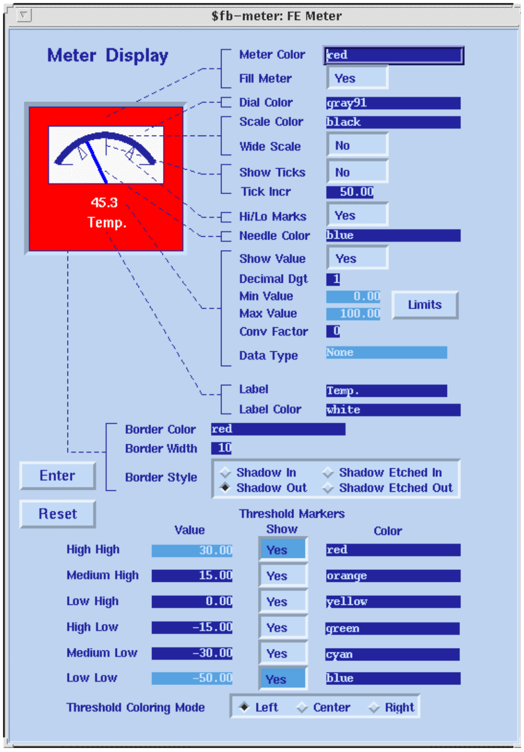
- Show the current **data value** just below the dial along with a label that indicates what type of reading is being shown.
- Show **high/low marks** that indicate how far the needle has traveled in either direction during the display runtime. These are shown as right triangles on the meter/gauge.
- Show **threshold indicators** (high-high, medium-high, low-high, high-low, medium-low, low-low). These bands of color on the numeric scale represent thresholds that can be preset or set dynamically by an application.
- Use **runtime annotations** (optional) to change colors and/or to blink, and/or to append text characters such as “HI” or “LO” next to the digital representation of the value whenever an event occurs, such as when the graphic indicator passes a threshold. This feature provides an additional level of information to the data display. For example, if a temperature reading is dangerously high, the graphic indicator may turn red and start blinking, and the characters “HI” may display next to the digital representation of the value.
- Show **borders** that give the image a three-dimensional appearance.

API information

The FWDU_SERVER sends only the current value. The limits and measurement End Item type are passed to the FWDU_SERVER at preview and the FWDU_SERVER sends data between max and min.

Display type specifications

Enter the following specifications, as illustrated on the panels below:



$fb−meter: FE Meter

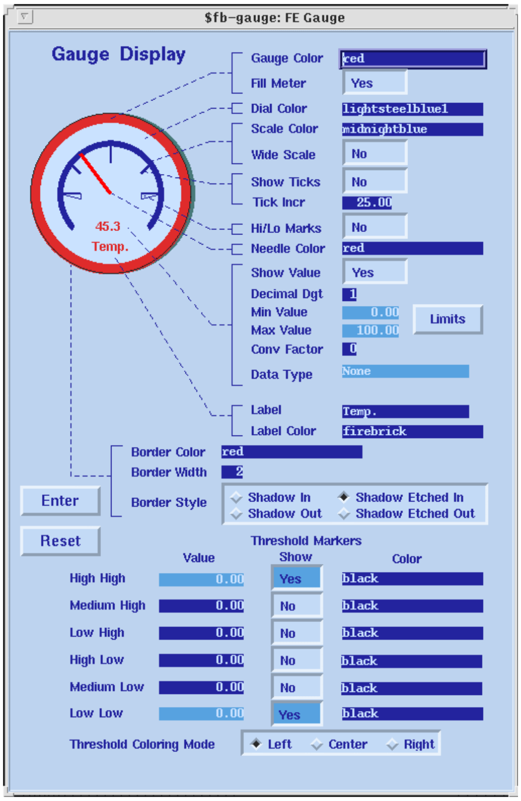
Meter Display

Meter Color: red
Fill Meter: Yes
Dial Color: gray91
Scale Color: black
Wide Scale: No
Show Ticks: No
Tick Incr: 50.00
Hi/Lo Marks: Yes
Needle Color: blue
Show Value: Yes
Decimal Dgt: 1
Min Value: 0.00
Max Value: 100.00
Conv Factor: 0
Data Type: None
Label: Temp.
Label Color: white
Border Color: red
Border Width: 10
Border Style: ○ Shadow In ○ Shadow Etched In ● Shadow Out ○ Shadow Etched Out

Threshold Markers

	Value	Show	Color
High High	30.00	Yes	red
Medium High	15.00	Yes	orange
Low High	0.00	Yes	yellow
High Low	-15.00	Yes	green
Medium Low	-30.00	Yes	cyan
Low Low	-50.00	Yes	blue

Threshold Coloring Mode: ● Left ○ Center ○ Right



$fb−gauge: FE Gauge

Gauge Display

Gauge Color: red
Fill Meter: Yes
Dial Color: lightsteelblue1
Scale Color: midnightblue
Wide Scale: No
Show Ticks: No
Tick Incr: 25.00
Hi/Lo Marks: No
Needle Color: red
Show Value: Yes
Decimal Dgt: 1
Min Value: 0.00
Max Value: 100.00
Conv Factor: 0
Data Type: None
Label: Temp.
Label Color: firebrick
Border Color: red
Border Width: 2
Border Style: ○ Shadow In ● Shadow Etched In ○ Shadow Out ○ Shadow Etched Out

Threshold Markers

	Value	Show	Color
High High	0.00	Yes	black
Medium High	0.00	No	black
Low High	0.00	No	black
High Low	0.00	No	black
Medium Low	0.00	No	black
Low Low	0.00	Yes	black

Threshold Coloring Mode: ● Left ○ Center ○ Right

Meter/Gauge Entries

Entry Option **Description**

Meter/Gauge Color Enter a color for the outer body or select a color by clicking the mouse OPTION button in this box to display a list of choices.

Fill Meter/Gauge Indicate whether to use the above color for a fill by clicking the mouse SELECT button in this box to toggle between *Yes* and *No.*

Dial Color Either enter a dial background color or select a color by clicking the mouse OPTION button in this box to display a list of choices.

Scale Color Either enter a color for the scale, tick marks, and tick mark values by clicking the mouse OPTION button in this box to display a list of choices.

Wide Scale Click the mouse SELECT button in this box to toggle between *Yes* and *No*. Indicate whether the scale should be highlighted between the left side or right of the scale to the current needle position (as shown in the previous illustration). Because this feature tends to slow displays down, use it sparingly. See also the *Threshold Coloring Mode*.

NOTE: If your gauge is too elliptical, the *Wide Scale* feature is disabled.

Show Ticks Indicate whether tick marks should be displayed by clicking the mouse SELECT button in this box to toggle between *Yes* and *No*.

Tick increment Enter a number representing the amount between tick marks.

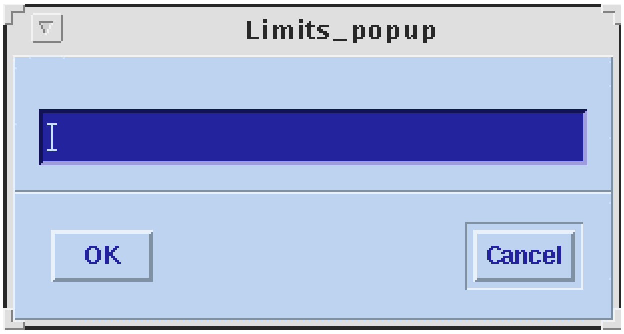
Hi/Lo Marks Indicate whether high/low value markers should be used, as discussed earlier, by clicking the mouse SELECT button in this box to toggle between *Yes* and *No*.

Needle Color Enter a color for the needle or select a color by clicking the mouse OPTION button in this box to display a list of choices. This choice only applies if Wide Scale is set to no.

Meter/Gauge Entries (Continued)

Entry Option	**Description**
Show Value	Indicate whether the incoming data value should be displayed below the dial by clicking the mouse SELECT button in this box to toggle between *Yes* and *No*.
Decimal Digits	If *Show Value* is *Yes*, enter the number of digits to be shown after the decimal point. The incoming data value is rounded to this number of digits.
Min Value	Read-only. Data is automatically taken from measurement End Item when associating measurement End Item. Data is Engineering Range Low Value
Max Value	Read-only. Data is automatically taken from measurement End Item when associating measurement End Item. Data is Engineering Range High Value.

If a measurement End Item is attached, you can choose from the measurement End Items nominal limit set (range 1-5), by pressing Limits button. The following window appears:



Conv Factor	The conversion code for incoming data (see ***Appendix F*** for details).
Data Type	Read-only. Data is automatically taken from measurement End Item when associating measurement End Item.
Label (optional)	If you want a label for this meter/gauge, enter a single line text string.
Label Color	If you enter a label, either enter a color or select a color by clicking the mouse OPTION button in this box to display a list of choices.

Meter/Gauge Entries (Continued)

Entry Option — **Description**

Border Color — For a border width greater than zero, either enter a border color or select the border color by clicking the mouse OPTION button in this box to display a list of choices.

Border Width — Enter an integer for the number of pixels used for the border width; a zero means no border.

Border Style — For a border width greater than zero (0), select a border style by clicking on one of the following options:

Shadow In
Shadow Out
Shadow Etched In
Shadow Etched Out

For each threshold you want to use, enter the following values:

Value — *Max and min are read-only. The six Data values are automatically taken from measurement End Item when associating measurement End Item.*
The six values are:

Danger Limits High Value
Nominal Limit High Value
Nominal Limit High Value
Nominal Limit High Value
Nominal Limit Low Value
Danger Limits Low Value

Show — *Max and Min are read-only (always Yes).*

Color — Either enter a fill color for the threshold or select a threshold color by clicking the mouse OPTION button in this box to display a list of choices.

Meter/Gauge Entries (Continued)

Entry Option | **Description**

Threshold Coloring Mode

The range of numbers included with each threshold is indicated by a band of color on the numeric scale. If the scale is defined as "wide," this color is also used as the fill color on the scale. Select the *Threshold Coloring Mode* by clicking the mouse SELECT button on one of the following options:

Left mode. The bands in this mode start at the thresholds and cover the range of numbers to the next highest threshold. The fill color on the scale is from left to right.

Center mode. In this mode, there are three different coloring schemes of the bands depending on the thresholds:

The bands for the high-low, high-medium, and high-high thresholds start at the thresholds and cover the range of numbers to the next highest threshold. The fill color on the scale is from left to right.

The bands for the low-high, low-medium, and low-low thresholds start at the thresholds and cover the range of numbers to the next lowest threshold. The fill color on the scale is from right to left.

The band of color that covers the range of numbers between the low-high and the high-low thresholds is the *DFD Foreground Color*.

Right mode. The bands in this mode start at the threshold and cover the range of numbers to the next lowest threshold. The fill color on the scale is from right to left.

Meter, Fixed-Scale Linear

Sample Format: *sample_fsl*

This view-only display type is either a vertically or horizontally-oriented rectangle with tick marks, value labels, graphic indicator (a filled triangle pointing to the value labels) and a bar (colored rectangular area) that extends from the bottom of the vertically-oriented meter (or from the left on the horizontally-oriented meter) to the indicator.

Optional features for the fixed-scale linear meter include:

- **Label.** This is located under the meter, which, for example, you can use to indicate its function or differentiate it from other meters.
- **Digital representation.** The current value is also displayed digitally in a box to the right of the vertically oriented meter or below the horizontally-oriented meter.
- **High and Low Limit Indicators**. These small triangular-shaped outlines located on the numeric scale reposition dynamically to record the highest and lowest values reached by the data since the last initialization of the meter.
- **Threshold Indicators** (high-high, medium-high, low-high, high-low, medium-low, low-low). These bands of color on the numeric scale represent thresholds that can be:
  - — preset
  - — set dynamically by the application
- **Bar Color Changes**. When a threshold has been passed during normal operations, the bar changes to the color defined for that threshold. You define the behavior of the coloring of the bar in one of two ways:
  - — Bottom reference. Each time a threshold is reached or exceeded, the color of the bar changes to that of the threshold.
  - — Middle reference. The bar is displayed in the threshold color when the value meets or exceeds the thresholds specified for high-low, high-medium, and high-high, or when the value falls below the thresholds specified by low-high, low-medium, and low-low. When the value is between the high-low and low-high, or when no thresholds are defined, the bar displays in the color defined in the *Fill Color* field.

- **Runtime annotations** cause the graphic indicator to change colors and/or to blink, and/or to append text characters such as “HI” or “LO” next to the digital representation of the value whenever an event occurs, such as passing a threshold. This feature provides an additional level of information to the data display. For example, if a temperature reading is dangerously high, the graphic indicator may turn red and start blinking, and the characters “HI” may display next to the digital representation of the value.

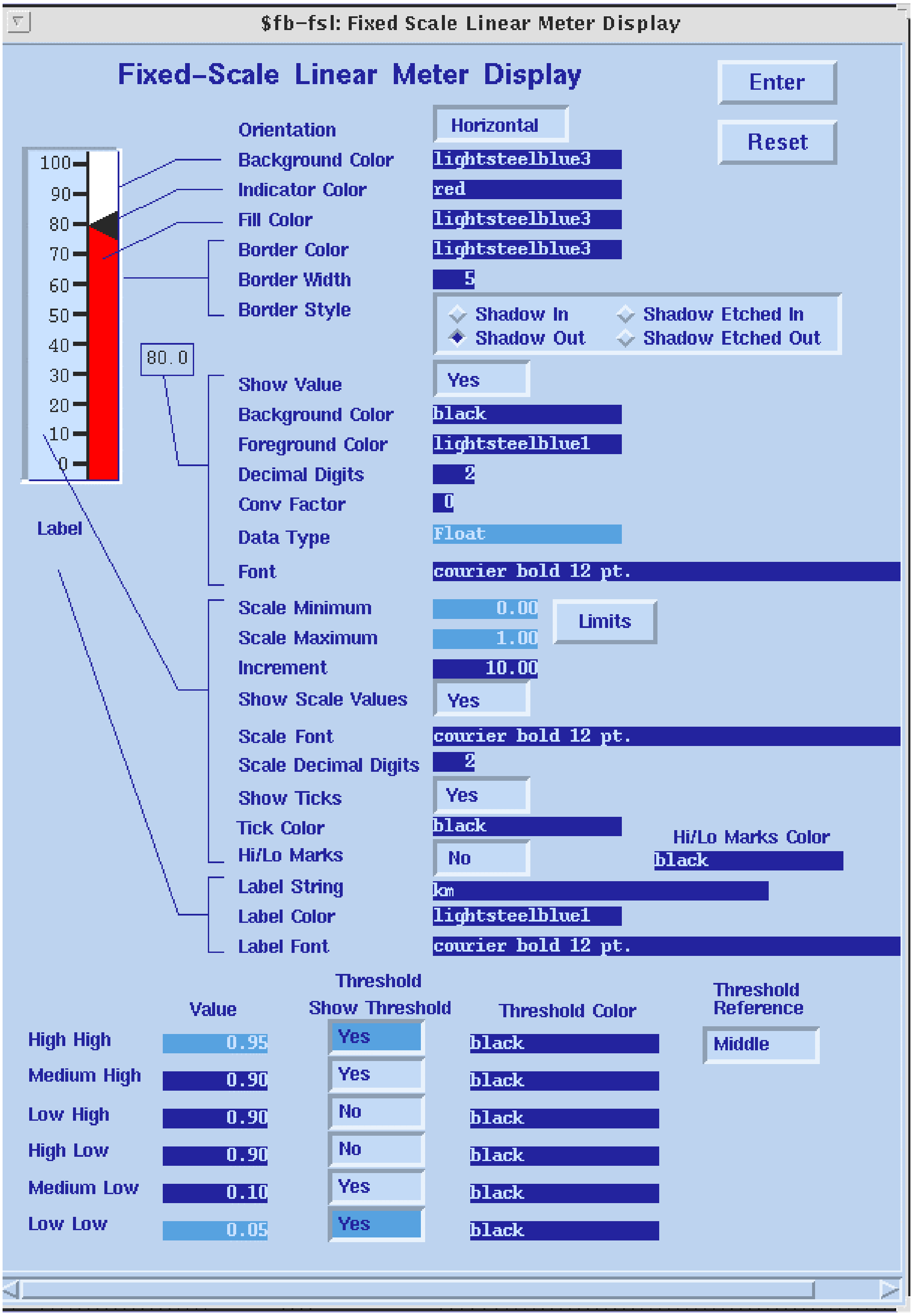
- **Borders** give the image a three-dimensional appearance.

API information

The FWDU_SERVER sends only the current value. The limits and measurement End Item type are passed to the FWDU_SERVER at preview and the FWDU_SERVER sends data between max and min.

Display type specifications

Enter the following specifications, as illustrated on the panel below:



Fixed-Scale Linear Meter Display

Orientation	Horizontal
Background Color	lightsteelblue3
Indicator Color	red
Fill Color	lightsteelblue3
Border Color	lightsteelblue3
Border Width	5
Border Style	○ Shadow In ○ Shadow Etched In ● Shadow Out ○ Shadow Etched Out
Show Value	Yes
Background Color	black
Foreground Color	lightsteelblue1
Decimal Digits	2
Conv Factor	0
Data Type	Float
Font	courier bold 12 pt.
Scale Minimum	0.00
Scale Maximum	1.00
Increment	10.00
Show Scale Values	Yes
Scale Font	courier bold 12 pt.
Scale Decimal Digits	2
Show Ticks	Yes
Tick Color	black
Hi/Lo Marks	No
Hi/Lo Marks Color	black
Label String	km
Label Color	lightsteelblue1
Label Font	courier bold 12 pt.

	Value	Threshold Show Threshold	Threshold Color	Threshold Reference
High High	0.95	Yes	black	Middle
Medium High	0.90	Yes	black	
Low High	0.90	No	black	
High Low	0.90	No	black	
Medium Low	0.10	Yes	black	
Low Low	0.05	Yes	black	

Fixed-Scale Linear Meter Entries

Entry Option **Description**

Orientation
Set the orientation of the meter by clicking the mouse SELECT button in this box to toggle between *Vertical* and *Horizontal*.

Background Color
Either enter a color for the background or select a color by clicking the mouse OPTION button in this box to display a list of choices.

Indicator Color
Either enter a color for the indicator or select a color by clicking the mouse OPTION button in this box to display a list of choices.

Fill Color
Either enter a color for the fill or select a color by clicking the mouse OPTION button in this box to display a list of choices.

Border Color
For a border width greater than zero, either enter a border color or select a color by clicking the mouse OPTION button in this box to display a list of choices.

Border Width
Enter an integer for the number of pixels used for the border width; a zero means no border.

Border Style
For a border width greater than zero, select a border style by clicking the mouse SELECT button on one of the following choices:

Shadow In
Shadow Out
Shadow Etched In
Shadow Etched Out

Show Value
Select whether to display the incoming data value digitally in a box below or beside the scale (depending on the orientation) by clicking the mouse SELECT button in this box to toggle between *Yes* and *No*.

Background Color
If you choose to show the value, either enter a color for the background of the box for the value or select a color by clicking the mouse OPTION button in this box to display a list of choices.

Fixed-Scale Linear Meter Entries (continued)

Entry Option — **Description**

Foreground Color
If you choose to show the value, either enter a color for the foreground of the box for the value or select a color by clicking the mouse OPTION button in this box to display a list of choices.

Decimal Digits
If you choose to show the value, enter the number of digits to display after the decimal point. Any incoming data value is truncated at this number of digits.

Conv Factor
If you choose to show the value, enter a conversion code for incoming data (see ***Appendix F*** for details).

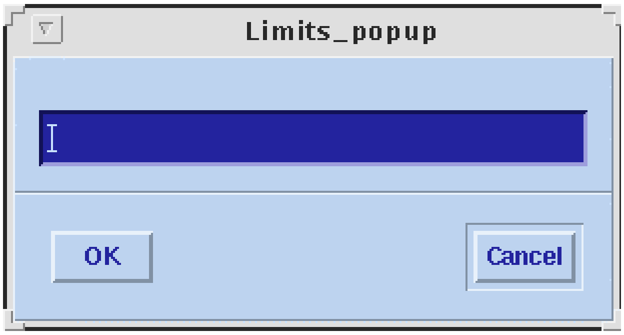
Data Type
Read-only. Data is automatically taken from measurement End Item when associating measurement End Item.

Font
If you choose to show the value, either enter a font for the value or select a color by clicking the mouse OPTION button in this box to display a list of choices.

Scale Minimum
Read-only. Data is automatically taken from measurement End Item when associating measurement End Item. Data is Engineering Range Low Value.

Scale Maximum
Read-only. Data is automatically taken from measurement End Item when associating measurement End Item. Data is Engineering Range High Value.

If a measurement End Item is attached, you can choose from the measurement End Items nominal limit set (range 1-5), by pressing Limits button. The following window appears:



Fixed-Scale Linear Meter Entries (continued)

Entry Option	Description
Increment	Enter a value for the increments between the maximum and minimum scale values.
Show Scale Values	Select whether to display the scale values by clicking the mouse SELECT button in this box to toggle between *Yes* and *No*.
Scale Font	If you are showing the scale values, either enter a font for the values on the scale or select a font by clicking the mouse OPTION button in this box to display a list of choices.
Scale Decimal Digits	If you are showing the scale values, enter the number of digits to display after the decimal point for the values on the scale.
Show Ticks	Select whether to display tick marks on the scale by clicking the mouse SELECT button in this box to toggle between *Yes* and *No*.
Tick Color	If displaying tick marks, either enter a color or select a color by clicking the mouse OPTION button in this box to display a list of choices.
Hi/Lo Marks	Select whether to display *High* and *Low* marks on the scale by clicking the mouse SELECT button in this box to toggle between *Yes* and *No*.
Hi/Lo Marks Color	If displaying *High* and *Low* marks, either enter a color or select a color by clicking the mouse OPTION button in this box to display a list of choices.
Label String	If you want a label for this meter, enter the single line text string here.
Label Color	If you enter a label, either enter a color or select a color by clicking the mouse OPTION button in this box to display a list of choices.
Label Font	If you enter a label, either enter a font for the label or select a font by clicking the mouse OPTION button in this box to display a list of choices.

Fixed-Scale Linear Meter Entries (continued)

Entry Option **Description**

For each threshold that you want to use, enter the following information:

Value
Max and min are read-only. The six Data values are automatic taken from measurement End Item when associating measurement End Item. The six values are:

Danger Limits High Value
Nominal Limit High Value
Nominal Limit High Value
Nominal Limit High Value
Nominal Limit Low Value
Danger Limits Low Value

Show Threshold
Max and Min are read-only (always Yes).

Threshold Color
Either enter a threshold color for each threshold that you want displayed or select a color by clicking the mouse OPTION button in this box to display a list of choices.

Threshold Reference
The range of numbers included with each threshold is indicated by a band of color on the numeric scale. Select a threshold reference by clicking the mouse SELECT button to select one of the following options:

Bottom: The bands in this mode start at the thresholds and cover the range of numbers to the next highest threshold.

Middle: The bands in this mode for the high-low, high-medium, and high-high thresholds start at the thresholds and cover the range of numbers to the next highest threshold. The bands for the low-high, low-medium, and low-low thresholds start at the thresholds and cover the range of numbers to the next lowest threshold. The band of color that covers the range of numbers between the low-high and the high-low thresholds is the *DFD Foreground Color*.

Meter, Moving-Scale Linear

Sample Format: *sample_msl*

The *Moving-Scale Linear Meter* display type is similar to the *Fixed-Scale Linear Meter* display type; the major difference is that the indicator (arrow) is stationary and centered in the *Moving-Scale Linear Meter*, while the tick marks and tick values on the numeric scale move.

Other differences from the *Fixed-Scale Linear Meter* include:

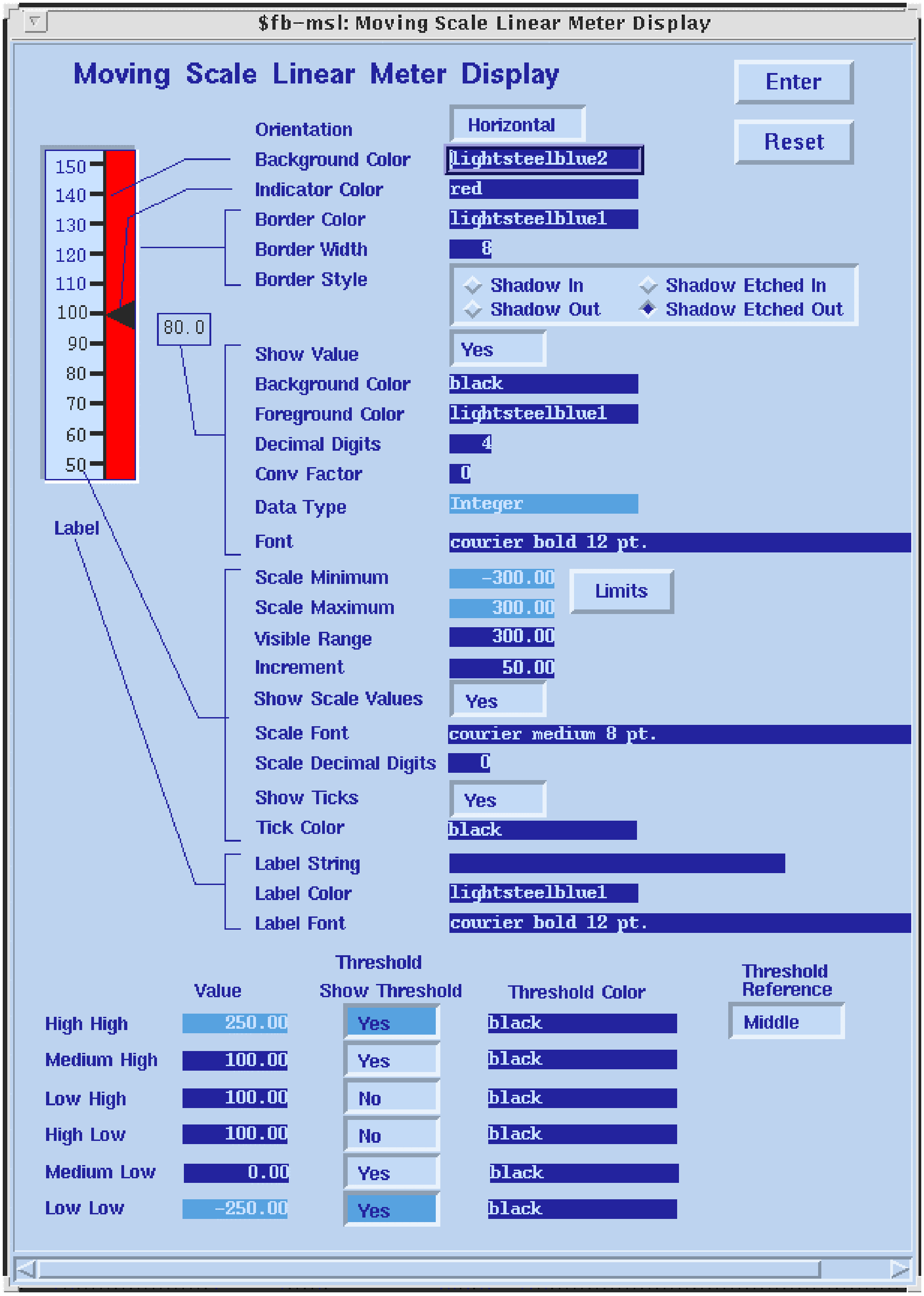
- The visible range of the meter must be specified.
- There is no “fill” color for the slide area, as the slide area color does not change as the thresholds are passed the way it does in a fixed-scale linear meter.
- High and Low Indicators are not supported on the *Moving-scale Linear Meter* display type, as they would usually be hidden (scrolled off the meter) and therefore useless.

API information

The FWDU_SERVER sends only the current value. The limits and measurement End Item type are passed to the FWDU_SERVER at preview and the FWDU_SERVER sends data between max and min.

Display type specifications

Enter the following specifications, as illustrated on the panel below:



Moving Scale Linear Meter Display

Orientation	Horizontal
Background Color	lightsteelblue2
Indicator Color	red
Border Color	lightsteelblue1
Border Width	8
Border Style	○ Shadow In ○ Shadow Etched In ○ Shadow Out ● Shadow Etched Out
Show Value	Yes
Background Color	black
Foreground Color	lightsteelblue1
Decimal Digits	4
Conv Factor	0
Data Type	Integer
Font	courier bold 12 pt.
Scale Minimum	-300.00
Scale Maximum	300.00
Visible Range	300.00
Increment	50.00
Show Scale Values	Yes
Scale Font	courier medium 8 pt.
Scale Decimal Digits	0
Show Ticks	Yes
Tick Color	black
Label String	
Label Color	lightsteelblue1
Label Font	courier bold 12 pt.

	Value	Threshold Show Threshold	Threshold Color	Threshold Reference
High High	250.00	Yes	black	Middle
Medium High	100.00	Yes	black	
Low High	100.00	No	black	
High Low	100.00	No	black	
Medium Low	0.00	Yes	black	
Low Low	-250.00	Yes	black	

Moving-Scale Linear Meter Entries

Entry Option — **Description**

Orientation

Set the orientation of the meter by clicking the mouse SELECT button in this box to toggle between *Vertical* and *Horizontal*.

Background Color

Either enter a color for the background or select a color by clicking the mouse OPTION button in this box to display a list of options.

Indicator Color

Either enter a color for the indicator or select a color by clicking the mouse OPTION button in this box to display a list of options.

Border Color

For a border width greater than zero, either enter a border color or select a color by clicking the mouse OPTION button in this box to display a list of options

Border Width

Enter an integer for the number of pixels used for the border width; a zero means no border.

Border Style

For a border width greater than zero, select a border style by clicking the mouse SELECT button on one of the following options:

Shadow In
Shadow Out
Shadow Etched In
Shadow Etched Out

Show Value

Select whether to display the incoming data value digitally beside or below the scale depending on orientation, by clicking the mouse SELECT button in this box to toggle between *Yes* and *No*.

Background Color

If you choose to show the value, either enter a color for the background of the box for the value or select a color by clicking the mouse OPTION button in this box to display a list of options.

Foreground Color

If you choose to show the value, either enter a color for the foreground of the box for the value or select a color by clicking the mouse OPTION button in this box to display a list of options.

Moving-Scale Linear Meter Entries (continued)

Entry Option — **Description**

Decimal Digits

If you are showing the value, enter the number of digits to display after the decimal point. Any incoming data value is rounded to this number of digits.

C*onv Factor*

If you are showing the value, enter a conversion code for incoming data (see ***Appendix F*** for details).

Data Type

Read-only. Data is automatically taken from measurement End Item when associating measurement End Item.

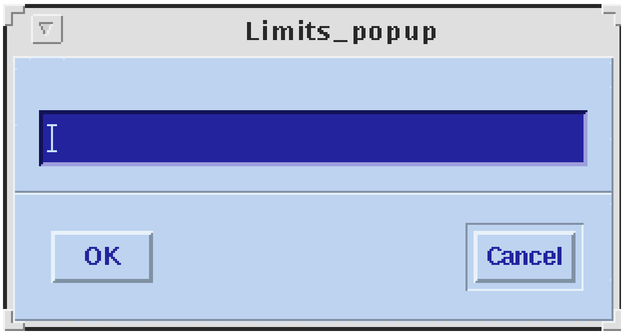
Scale Minimum

Read-only. Data is automatically taken from measurement End Item when associating measurement End Item. Data is Engineering Range Low Value

Scale Maximum

Read-only. Data is automatically taken from measurement End Item when associating measurement End Item. Data is Engineering Range High Value

If a measurement End Item is attached, you can choose from the measurement End Items nominal limit set (range 1-5), by pressing Limits button. The following window appears:



Font

If you are showing the value, either enter a font for the value or select a font by clicking the mouse OPTION button in this box to display a list of options.

Visible Range

Enter the range of values that are visible on the moving scale at any one time.

Increment

Enter a value for the increment between scale values.

Moving-Scale Linear Meter Entries (continued)

Entry Option	Description
Show Scale Values	Select whether to display the scale values by clicking the mouse SELECT button in this box to toggle between *Yes* and *No*.
Scale Font	If you show the scale values, either enter a font for the numbers on the scale or select a font by clicking the mouse OPTION button in this box to display a list of options.
Scale Decimal Digits	If you show the scale values, enter the number of digits to display after the decimal point for the numbers on the scale.
Show Ticks	Select whether to display tick marks on the scale by clicking the mouse SELECT button in the box to the right of this field to toggle between *Yes* and *No*.
Tick Color	If displaying tick marks, either enter a color or select a color by clicking the mouse OPTION button in this box to display a list of options.
Label String (optional)	If you want a label for this meter, enter the text string.
Label Color	If you enter a label, either enter a color or select a color by clicking the mouse OPTION button in this box to display a list of options.
Label Font	If you enter a label, either enter a font for the label or select a font by clicking the mouse OPTION button in this box to display a list of options.
Value	Max and min are read-only. The six Data values are automatic taken from measurement End Item when associating measurement End Item. The six Values are: Danger Limits High Value Nominal Limit High Value Nominal Limit High Value Nominal Limit High Value Nominal Limit Low Value Danger Limits Low Value
Show Threshold	Max and Min are read-only (always Yes).

Moving-Scale Linear Meter Entries (continued)

Entry Option **Description**

Threshold Color

Either enter a threshold color for each threshold you want displayed or select a color by clicking the mouse OPTION button in this box to display a list of options.

Threshold Reference

The range of numbers included with each threshold is indicated by a band of color on the numeric scale. Select the threshold reference by clicking the mouse SELECT button in this box below this field to select one of the following options:

Bottom. The bands in this mode start at the thresholds and cover the range of numbers to the next highest threshold.

Middle. The bands in this mode for the high-low, high-medium, and high-high thresholds start at the thresholds and cover the range of numbers to the next highest threshold. The bands for the low-high, low-medium, and low-low thresholds start at the thresholds and cover the range of numbers to the next lowest threshold. The band of color that covers the range of numbers between the low-high and the high-low thresholds is the *DFD Foreground Color*.

Object Icon

Sample Format: *sample_objicon*

With the *Object Icon* display type, you can display a series of graphic images or *symbols*. These images can be overlapped to give the illusion of a single object with moving parts.

For example, the user might see a valve that opens and closes; a switch that turns on or off, or a spacecraft or aircraft that tracks across the screen. To create motion with a piece of equipment, make each graphic symbol nearly identical, except for the moving item. As incoming data causes different symbols to be displayed, the only part of the image that seems to change is the moving item. For motion on an object such as an aircraft, you would move the same graphic to a new set of coordinates.

You can create (or copy and modify) the symbols using a bitmap editor program capable of producing an *X bitmap file* (most X Window System workstations have generic bitmap editors). Each symbol must be saved as a separate file with a `.sym` suffix and stored in a `$Sammi/data` directory (as specified by `SAM2_DATAFILE`, either in your own environment or in the `start_sammi` script). For graphics that will placed on top of each other, you should make the graphics the same size.

You must also create a lookup table that incoming data values are compared to, which then displays a certain graphic. You can create this file with any text editor; add the extension `.safs` to the file name when you save. Please refer to ***Appendix L*** for a sample file.

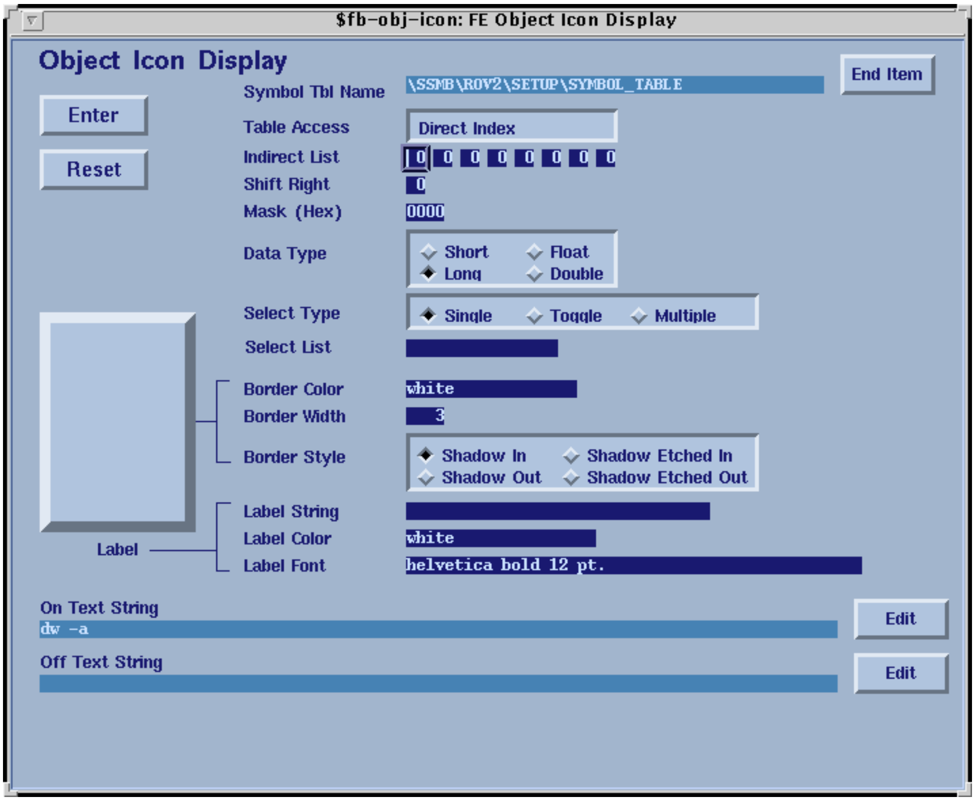
Although similar to the *Symbol Table* display type, the *Object Icon* display type is user-selectable and:

- Flashes each time it is selected regardless of its select type.
- Can be one of three select types:
    - **Single.** The command associated with the *On* selection is sent whenever the user clicks the mouse SELECT button on the *Object Icon*.
    - **Toggle.** The command sent reflects the state of the *Object Icon* display type; that is, each time the server sends the *Object Icon* a new value, the state is set according to the value received. If the value is zero, the state is zero; if the value is not zero, the state is one. You must enter zero for one number and any positive number for the other. When the *Object Icon*'s state is zero, the command defined for the *On* state is sent when the user clicks the mouse SELECT button on *the Object Icon*, otherwise the command defined for the *Off* state is sent.

— **Multiple.** You create a *Selection List* dynamic field, then enter the name of that dynamic field in the *Select List* field on *the Object Icon* display panel. This list pops up when the user clicks the mouse SELECT button on the *Object Icon* so the user can make selection(s) from the list.

Display Type Specifications

Enter the following specifications, as illustrated on the panel below:



Symbol Tbl Name \SSMB\ROV2\SETUP\SYMBOL_TABLE

Table Access Direct Index

Indirect List 0 0 0 0 0 0 0 0

Shift Right 0

Mask (Hex) 0000

Data Type ◇ Short ◇ Float ◆ Long ◇ Double

Select Type ◆ Single ◇ Toggle ◇ Multiple

Select List

Border Color white

Border Width 3

Border Style ◆ Shadow In ◇ Shadow Etched In ◇ Shadow Out ◇ Shadow Etched Out

Label String

Label Color white

Label Font helvetica bold 12 pt.

On Text String dw -a

Off Text String

Object Icon Display Entries

Entry Option	**Description**
Symbol Tbl Name	End Item of type FWDU_SYMBOL_TABLE_TEXT.

Object Icon Display Entries (continued)

Entry Option **Description**

Table Access

Select the type of index to be used with the index-lookup method. (Refer to the ***Lookup tables and indexing*** section earlier in this chapter.) If the symbol table name specifies the value-lookup method is to be used, this entry is ignored. Otherwise, click the mouse SELECT button in this box to toggle between the following options:

Direct Index
Indirect Index

Indirect List
(Indirect index-lookup only)

Enter the list of row numbers to be looked up for final converted values of 0 through 7, as described in the ***Lookup tables and indexing*** section earlier in this chapter.

Mask (Hex)
(Direct index-lookup only)

Enter the hexadecimal value that is to be bitwise ANDed with the right-shifted data value. If Mask is 0, the incoming data value will not be shifted or masked. See ***Appendix G Shifting and Masking*** for more information.

Shift Right
(Direct index-lookup only)

Enter the number of bits by which the incoming data value is to be right-shifted (if any). See ***Appendix G Shifting and Masking*** for more information.

Data Type

Select the type of incoming data value being received by the dynamic field by clicking the mouse SELECT button on one of the following options:

Short
Long
Float
Double

Object Icon Display Entries (continued)

Entry Option **Description**

Select Type

Select the type of *Object Icon* by clicking the mouse SELECT button on one of the following options:

Single. The command associated with the *On* selection is sent whenever the user clicks the mouse SELECT button on the *Object Icon.*

Toggle. The command sent reflects the state of the *Object Icon* display type; that is, each time the server sends the *Object Icon* a new value, the state is set according to the value received. If the value is zero, the state is zero; if the value is not zero, the state is one. When the user clicks the mouse SELECT button on the *Object Icon* when its state is zero the command defined for the *On* state is sent, otherwise the command defined for the *Off* state is sent.

Multiple. A selection list will pop up when the *Object Icon* is clicked on with the mouse SELECT button. The user then makes selection(s) from the list.

Select List

If you chose a multiple select type, enter the *Selection List* DFD name.

Border Color

For a border width greater than zero, either enter a border color or select the border color by clicking the mouse OPTION button in this box to display a list of choices.

Border Thickness

Enter the integer number of pixels for a border thickness.

Border Style

For a border width greater than zero, select a border style by clicking the mouse SELECT button on one of the following options:

Shadow In
Shadow Out
Shadow Etched In
Shadow Etched Out

Object Icon Display Entries (continued)

Entry Option — **Description**

Label String (optional)

Enter a string for the text label; this may be up to 32 characters in length, including new-line characters. You may format the label in as many lines as desired. New lines are specified by entering `\n` anywhere in the text label (`\n` when found, is interpreted as a new line and does not print. A double backslash n [`\\n`] is printed as \n). Spacing and margins for the labels are specified as part of the label text. For example, if you want a margin of 1 character on the top, bottom, and sides of the button label with a two-line label, you would specify the label text as:

```
\n first line of text  \n second line
of text \n.
```

Label Color

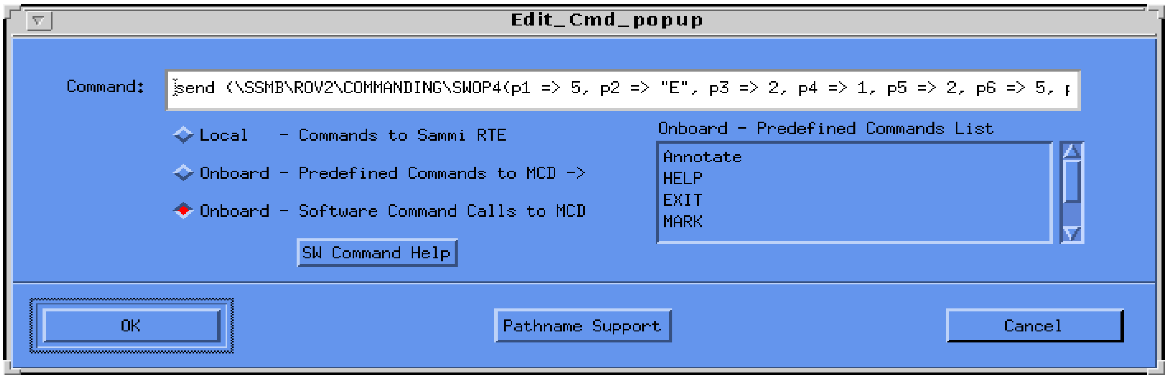
If you enter a label, either enter a color here or click the mouse SELECT button to display a list of choices.

Label Font

If you enter a label, either enter a font for the label or click the mouse OPTION button in this box to display a list of

On/Off Text String

FWDU command send to the runtimesystem/data server. Pressing the Edit button, the following window appears:



Edit_Cmd_popup

Command: `send (\SSMB\ROV2\COMMANDING\SWOP4(p1 => 5, p2 => "E", p3 => 2, p4 => 1, p5 => 2, p6 => 5, p`

○ Local - Commands to Sammi RTE

○ Onboard - Predefined Commands to MCD ->

● Onboard - Software Command Calls to MCD

For a detailed description of the Edit_Cmd_popup see “Entering a Command” on page 195.

Option List

Sample Format: *sample_menu*

Any dynamic field you create can have a pop-up *Option List* display type associated with it. An *Option List* is basically a way of viewing all possible entry selections for a given dynamic field on a set list, then selecting one. The *Sammi* user will display this *Option List* at runtime by clicking the OPTION button directly on the dynamic field.

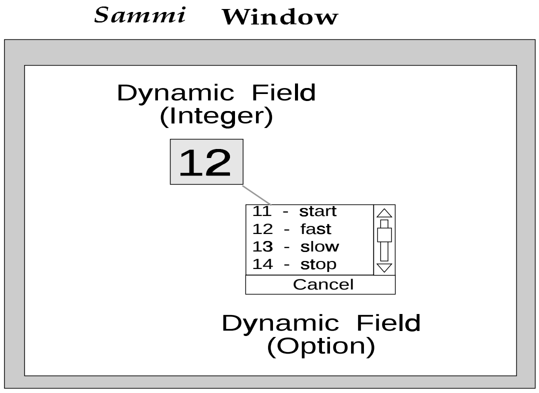
Option Lists and Select Lists are similar, but Select Lists offer more functions; please refer to the Select List section in this chapter for details.

You can create two types of option lists:

- **Standard Option List.** This type inserts the user's selection directly into another dynamic field in the same format (most option lists you probably have used in the Format Editor work this way). Thus, a *Standard Option List* should only be used with dynamic fields that accept user entries (*Real, Text, Integer, Custom Time*, etc.).

- **Command Option List.** This type sends the user's selection directly to an application specified as the logical server for data access to this dynamic field (thus, the user's selection is not inserted into the dynamic field).

The illustration below shows a *Standard Option List* that has been linked to an *Integer* dynamic field; this list will pop up when the user clicks the mouse OPTION button on the *Integer* dynamic field.



Notice the *Option List* includes *not only* the appropriate entries for the *Integer* dynamic field (11, 12, etc.), but an explanation of each entry (start, fast, etc.). The *Integer* dynamic field was deliberately created to be only two characters wide.

When the user makes a selection, the entire text of the selection is inserted into the *Integer* field. However, since only the first two characters fit, only the first two characters are used.

This is a handy method for creating standard option lists that include both entry options and definitions.

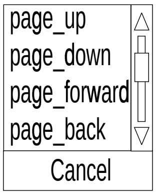
The same effect can be created for a command-type option list by having the application created to edit all but the characters it needs from the user's selection.

Both the *Option List* and its target field are dynamic fields that must be created using the *DFD Display* panel (discussed in ***Chapter 6***). In the illustration on the previous page, you link the *Option List* field to the *Integer* field by entering the *DFD Name* of the *Option List* in the *Option* entry on the *Integer* field's *DFD Display* panel. Toggling the *Cmnd* entry to *Yes* indicates the *Option List* is a *command type*. Toggling the *Cmnd* entry to *No* indicates the *Option List* is a *standard type*.

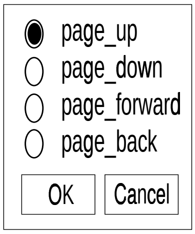
The dynamic field area for an *Option List* is not actually where the *Option List* appears. The final size and positioning of the option list is controlled by *Sammi*; thus, you can create the dynamic field in any size or position desired.

The *Option List* takes up no room in the final *Sammi* window; it remains invisible until the *Sammi* user clicks on the OPTION button. When it does appear, the *Option List* overlays other window components until the *Sammi* user selects an option from the list; then it disappears again.

Depending on your specifications, the *Option List* can be either a *scrollable* list box or a *radio box* with buttons that can only be selected one at a time. See the illustration below:



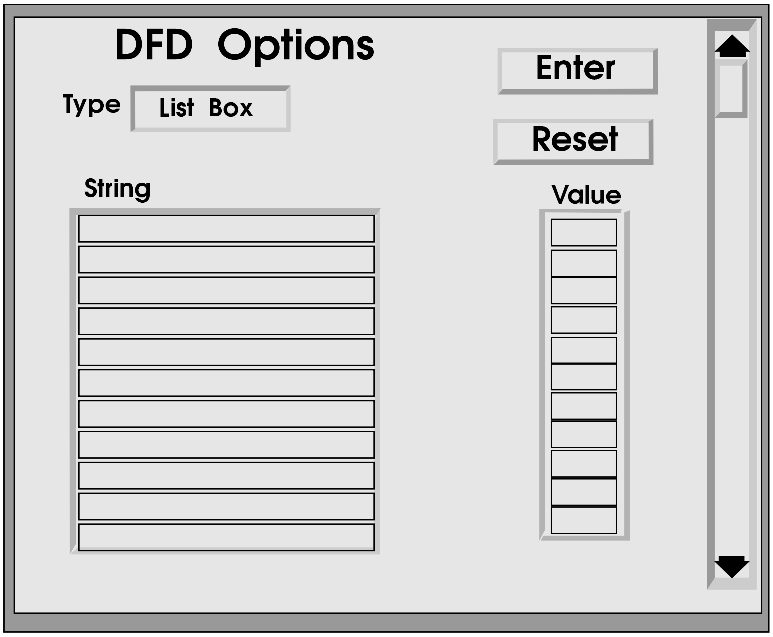
Scrollable List Box
Option List



Radio Box
Option List

Display type specifications

Enter the following specifications, as illustrated on the panel below:



Type List Box

DFD Options Entries

Entry Option	**Description**
Type	Select the type of option list to be displayed by clicking the mouse SELECT button in this box to toggle between *List Box* and *Radio Box.*
String	Enter each of the selections exactly as you want them to appear on the option list. If only *part* of the selection must serve as the actual entry, make sure it is placed at the beginning of the line and that the target dynamic field for this option list is only wide enough to accept the valid characters (as explained earlier).
Value	For use with an application; you can pass the value entered here to the application, along with a text string. This value can be interpreted by the application.

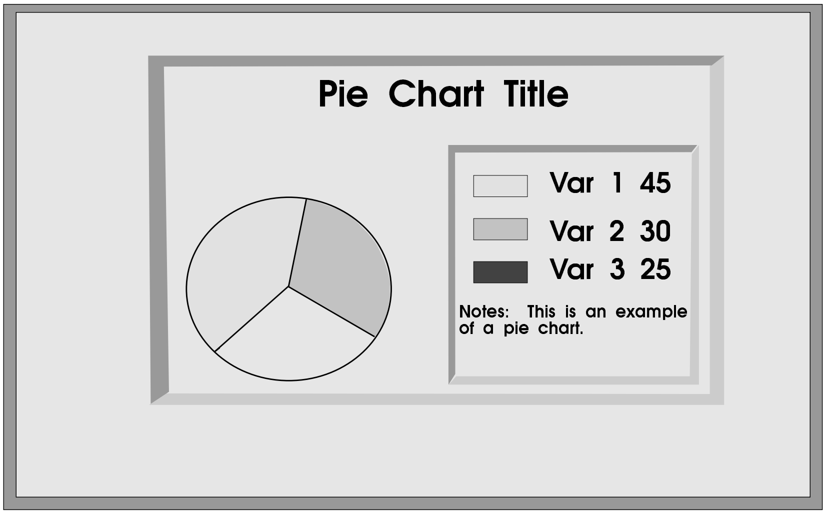
Pie Chart

Sample Format: *sample_piechart*

The *Pie Chart* display type creates a view-only pie chart representation of real numbers and/or integers, (see the illustration below).

A single *Pie Chart* DFD can have up to 256 slices, but to preserve readability you should probably use no more than ten or twelve.

Sammi scales the pie chart automatically to fit the area covered by a bounding box that encompasses the pie chart, and (if specified), its title and legend.



For the *Pie Chart* display type, you can:

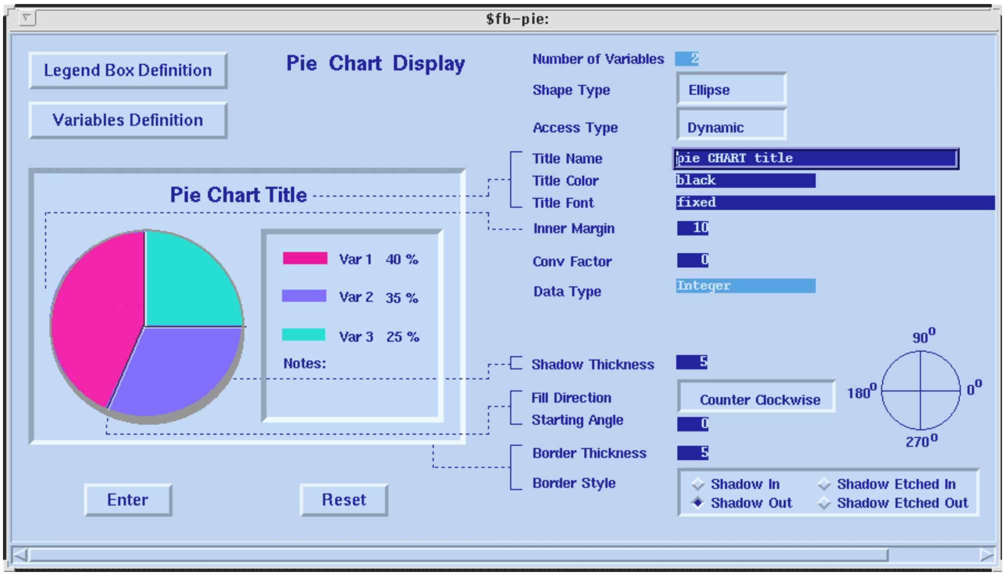
- Create a title (optional).
- Choose the colors and the fonts for titles and labels.
- Create borders and margins inside of borders.
- Create a legend that may consist of:
  - — a title (optional)
  - — labels for each variable (optional)
  - — an area in which to display the digital value for each variable (optional)
  - — patches of color/texture that relate the variables to the pie pieces (optional)
  - — notes (optional)
- Choose the fill color and texture for the pie slices.
- Add a shadow to the pie.
- Add runtime annotations.

API information

The runtime data buffer for the *Pie Chart* display type must contain one (1) value for each variable defined (up to 256 values). The runtime data buffer can also contain one quality value for each variable to implement runtime annotations.

Pie Chart Display type specifications

Enter the following specifications, as illustrated on the panel below. To define variables for the pie chart, click the mouse SELECT button on the *Variables Definition* button; the *Pie Chart Variable Display* panel displays. To define a legend, click the mouse SELECT button on the *Legend Box Definition* button; the *Legend Display* panel displays.



Number of Variables 2
Shape Type Ellipse
Access Type Dynamic
Title Name pie CHART title
Title Color black
Title Font fixed
Inner Margin 10
Conv Factor 0
Data Type Integer
Shadow Thickness 5
Fill Direction Counter Clockwise
Starting Angle 0
Border Thickness 5
Border Style ◇ Shadow In ◇ Shadow Etched In ◆ Shadow Out ◇ Shadow Etched Out

Pie Chart Display Entries

Entry Option	Description
Number of Variables	This is a display-only field. The value is calculated when you define the variables on the *Pie Chart Variables Display* panel. (To access this panel, click the mouse SELECT button on the *Variables Definition* button.)
Shape Type	Select the shape of the pie by clicking the mouse SELECT button in this box to toggle between *Circle* and *Ellipse.*
Access Type	Select the access type for the pie by clicking the mouse SELECT button in this box to toggle between: **Static.** The pie chart is defined on the *Pie Chart Variables Display* panel and does not update during runtime. **Dynamic.** The pie chart updates during runtime depending on the incoming data.
Title Name	Enter the text for the chart title (optional).

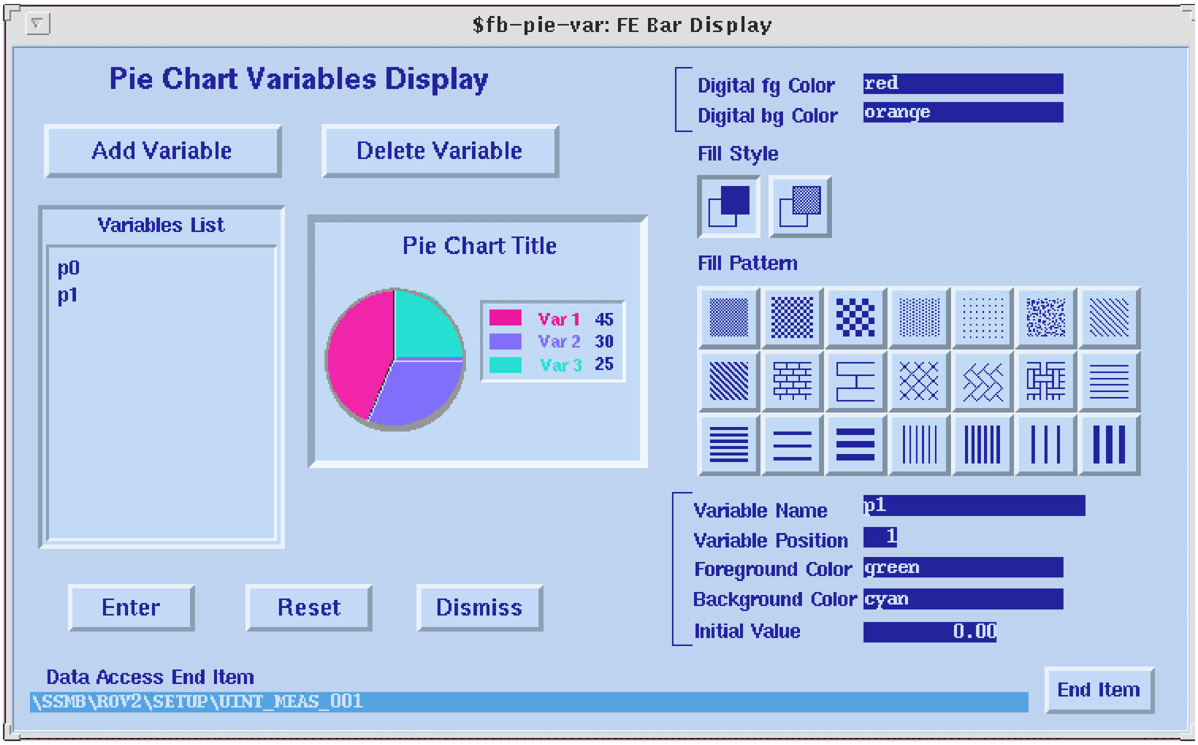
Pie Chart Display Entries (continued)

Entry Option	**Description**
Title Color	If you entered a string in the *Title Name* field, either enter a color for the chart title, or click the mouse OPTION button in this box to display a list of choices.
Title Font	If you entered a string in the *Title Name* field, either enter a font or click the mouse OPTION button in this box to display a list of choices.
Inner Margin	Enter the width of the margin inside the DFDs bounding border (in pixels).
Conv Factor	Enter the conversion code for incoming data (see ***Appendix F*** for details).
Data Type	Read-only. Is read from the End Item.
Shadow Thickness	Enter an integer for the number of pixels used for the shadow thickness; a zero means no shadow.
Fill Direction	This tells the Runtime Environment which direction the pie slices fill. Click the mouse SELECT button in this box to toggle between *Clockwise* and *Counter-clockwise*.
Starting Angle	Enter the number of degrees on the pie's circumference to indicate the starting point for the first variable.
Border Thickness	Enter an integer for the number of pixels in the border; a zero (0) means no border.
Border Style	For a border thickness greater than zero (0), select a border style by clicking the button next to one of the following options: **Shadow In** **Shadow Out** **Shadow Etched In** **Shadow Etched Out**

Pie Chart Variables Display type specifications

Enter the following specifications for each variable (pie slice), as illustrated on the panel below. To display this panel, click the mouse SELECT button on the *Variables*

Definition button on the *Pie Chart Display* panel.



Variables List: p0, p1

Digital fg Color: red
Digital bg Color: orange
Variable Name: p1
Variable Position: 1
Foreground Color: green
Background Color: cyan
Initial Value: 0.00
Data Access End Item: \SSMB\ROV2\SETUP\UINT_MEAS_001

To add a variable, click on the *Add Variable* button, then enter information for the variable in the appropriate boxes. Once you have entered information for a variable, either press the RETURN key or click the mouse SELECT button on the *Enter* button.

There are two ways to add a variable to the middle of an existing list of variables:

- Click the mouse SELECT button on the variable name in the *Variables List* just above where you want to add a new variable, then click the mouse SELECT button on the *Add Variable* button.

- Click the mouse SELECT button on the *Add Variable* button. Type a new value in the *Variable Position* field, representing the location to which you want the new variable. When you press the RETURN key or click the mouse SELECT button on the *Enter* button, the variable is repositioned.

In either case, the *Variable Position* field for all variables that follow the one that you add are automatically updated; the *Variable List* is sorted in *Variable Position* order.

To change a variable, click the mouse SELECT button on the name in the *Variables List*; make your changes in the appropriate fields.

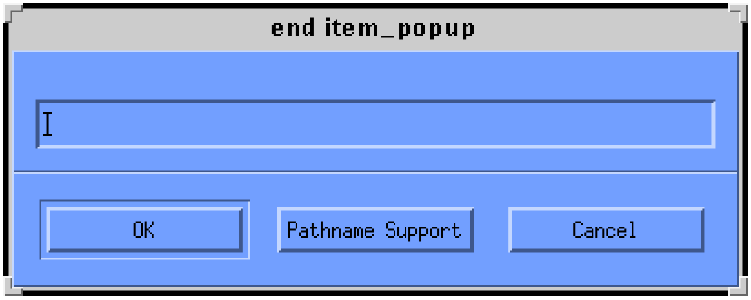
To delete a variable, click the mouse SELECT button on the name in the *Variables List.* Then click the mouse SELECT button on the *Delete Variable* button. If you click the mouse SELECT button on the *Delete Variable* button without making a selection, the bottom item of the *Variable List* is deleted.

When you have added all the variables that you want, close the panel by clicking the mouse SELECT button on the *Dismiss* button.

Pie Chart Variables Display Entries

Entry Option	**Description**
Digital fg Color	Either enter a color for the foreground of the digital value, or click the mouse OPTION button in this box to display a list of choices.
Digital bg Color	Either enter a color for the background of the digital value or click the mouse OPTION button in this box to display a list of choices.
Fill Style	Select a fill style for the piece of pie and legend patch representing this variable by clicking the mouse SELECT button on either the *Solid* (on the left) or the *Stipple* button (on the right).
Fill Pattern	If you selected the *Stipple* style, select a fill pattern for the variable by clicking the mouse SELECT button on the button next to the desired fill pattern.
Variable Name	Enter a label for the variable.
Variable Position	Enter an integer for the relative location of the variable.
Foreground Color	Either enter a color for the foreground or click the mouse OPTION button in this box to display a list of choices.
Background Color	If you selected the *Stipple* style, either enter a color for the background or click the mouse OPTION button to display a list of choices.
Initial Value	Enter a number greater than zero (0) for the initial value of the variable. This defaults to zero.
Data Access End Item	1. Press the End Item button. The following window

appears:

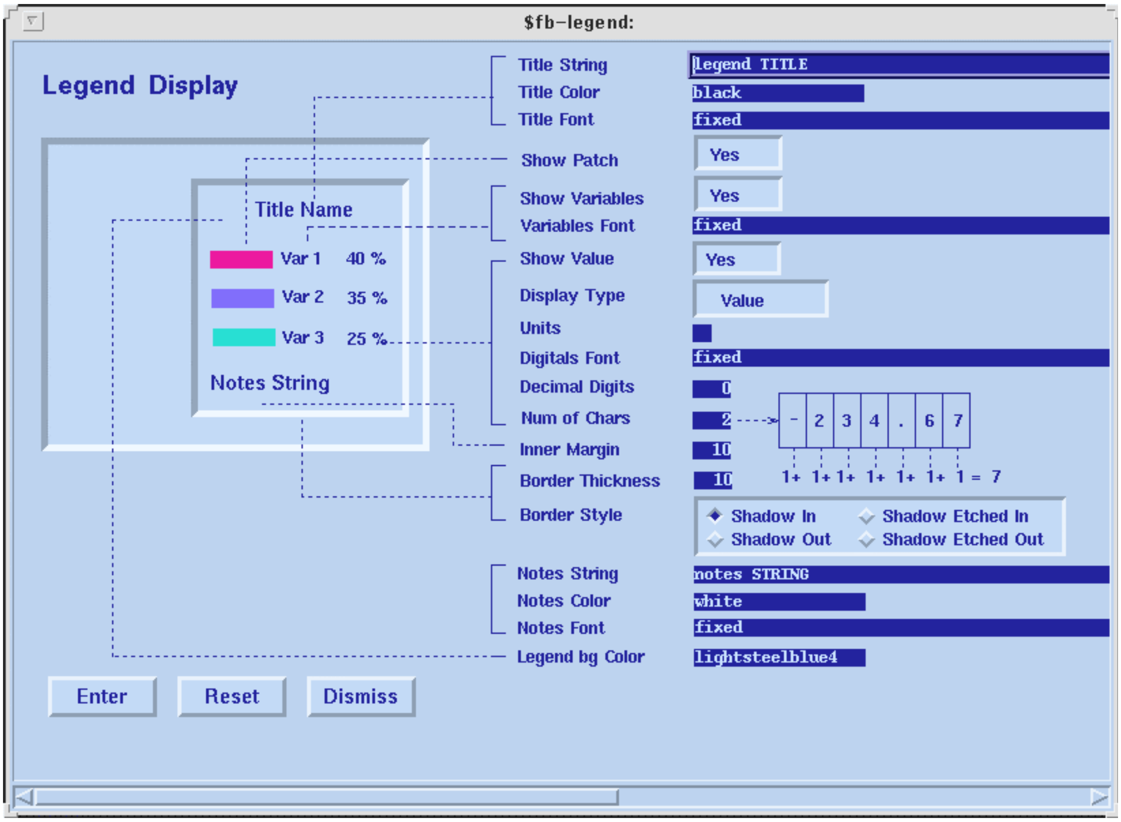


2. Type the complete the Pathname or use Pathname Support.
3. Press the OK button. The Data Access End item field is filled.

Legend Display specifications

Enter the following specifications for the legend, as illustrated on the panel below. To display this panel, click the mouse SELECT button on the *Legend Box Definition* button of the *Pie Chart Display* panel.

When you have finished entering the legend definitions, use the *Dismiss* button to close the panel.



$fb-legend:

Legend Display

Title String: legend TITLE
Title Color: black
Title Font: fixed
Show Patch: Yes
Show Variables: Yes
Variables Font: fixed
Show Value: Yes
Display Type: Value
Units:
Digitals Font: fixed
Decimal Digits: 0
Num of Chars: 2
Inner Margin: 10
Border Thickness: 10
Border Style: ◆ Shadow In ◇ Shadow Etched In ◇ Shadow Out ◇ Shadow Etched Out
Notes String: notes STRING
Notes Color: white
Notes Font: fixed
Legend bg Color: lightsteelblue4

Pie Chart Legend Display Entries

Entry Option	Description
Title String	Enter a string for the title; this can be up to 32 characters in length, including new-line characters. You can format the title in as many lines as desired. New lines are specified by entering \n anywhere in the text label (\n when found, is interpreted as a new line and does not print. A double backslash n [\\n] is printed as \ n). Spacing and margins for the title are specified as part of the text. For example, if you want a margin of 1 character on the top, bottom, and sides of the label with a two-line title, you would enter:

	`\n first line of text  \n second line of text \n.`
Title Color	Either enter a color for the legend title string or click the mouse OPTION button in this box to display a list of choices.

Pie Chart Legend Display Entries (continued)

Entry Option	**Description**
Title Font	Either enter a font for the legend title string or click the mouse OPTION button in this box to display a list of choices.
Show Patch	Select whether a patch of color/texture for each variable appears on the legend by clicking the mouse SELECT button in this box to toggle between *Yes* and *No*.
Show Variables	Select whether the variable name is displayed by clicking the mouse SELECT button in this box to toggle between *Yes* and *No*.
Variables Font	If you selected *Yes* for the *Show Variables*, either enter a font for the variables string or click the mouse OPTION button in this box to display a list of choices.
Show Value	Select whether the data value is displayed by clicking the mouse SELECT button in this box to toggle between *Yes* and *No*.
Display Type	Select how the data is presented in the digital value field by clicking the mouse SELECT button in the box to toggle between: **Value**. Actual value of the data. **Percentage**. Part of the pie the data represents.
Units	Enter a unit measurement of 1 or 2 characters, such as a percent sign (%), that displays after the value (or after the runtime annotation field).
Digitals Font	If you selected *Yes* for the *Show Value*, either enter a font for the value, or click the mouse OPTION button in this box to display an option list.
Decimal Digits	If you selected *Yes* for *Show Value*, enter the number of digits to be included to the right of the decimal point in the displayed value (for real numbers only).

Num of Chars — Enter an integer greater than zero for the number of characters displayed in the digital display.

Inner Margin — Enter the width (in pixels) for a margin surrounding the legend.

Pie Chart Legend Display Entries (continued)

Entry Option — **Description**

Border Thickness — Enter an integer for the number of pixels used for the border thickness; a zero means no border.

Border Style — For a border thickness greater than zero (0), select a border style by clicking the mouse SELECT button on one of these buttons:

Shadow In
Shadow Out
Shadow Etched In
Shadow Etched Out

Notes String — Enter the text for notes (if any). You can format the string in as many lines as desired. New lines are specified by entering `\n` anywhere in the text (`\n` when found, is interpreted as a new line and does not print. A double backslash n [`\\n`] is printed as \n). Spacing and margins for the string is specified as part of the string. For example, if you want a margin of 1 character on the top, bottom, and sides of the string with a two-line string, you would enter:

```
\n first line of text  \n second line
of text \n.
```

Notes Color — Either enter a color for the notes string, or click the mouse OPTION button in this box to display an option list.

Notes Font — Either enter a font for the notes string or click the mouse button in this field to display a list of choices.

Legend bg Color — Either enter a color for the legend's background or click the mouse button in this field to display a list of choices.

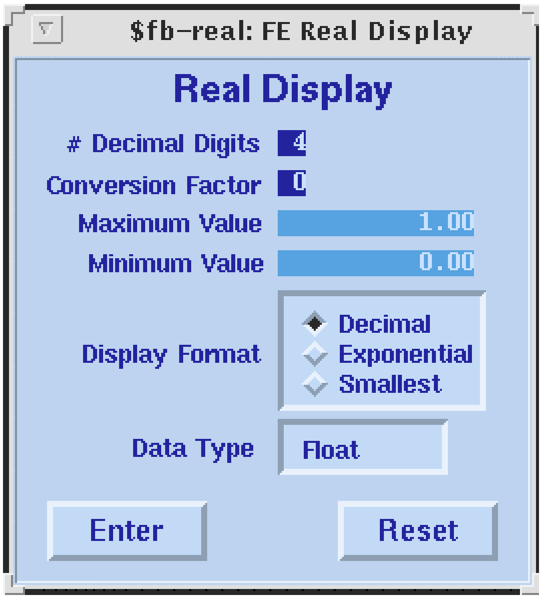
Real

Sample Format: *sample_litrl*

The *Real* display type displays and accepts real numbers (that is, single and double-precision floating point numbers) as input from the user or an application.

Display type specifications

Enter the following specifications, as illustrated on the panel below.



$fb-real: FE Real Display

Real Display

# Decimal Digits 4

Conversion Factor 0

Maximum Value 1.00

Minimum Value 0.00

Display Format ◆ Decimal ◇ Exponential ◇ Smallest

Data Type Float

Real Display Entries

Entry Option	**Description**
Decimal Digits	Enter the number of digits to be shown after the decimal point in the displayed value. The incoming data value is rounded up or down to this number of digits.
Conversion Factor	Enter the conversion code for incoming data (see ***Appendix F*** for details).
Maximum Value	Read-only. Data is automatically taken from End Item when associating measurement End Item. Data is Engineering Range High Value.

Real Display Entries (continued)

Entry Option	Description
Minimum Value	Read-only. Data is automatically taken from End Item when associating measurement End Item. Data is Engineering Range Low Value
Display Format	Enter the desired format for displaying numbers, which can be either decimal, exponential, or both. **Decimal** format is the normal method of displaying numbers. **Exponential** format is a shorthand way of displaying very large or small numbers. **Smallest** format means use either decimal or exponential to produce the shortest display (not supported on the PS/2 running AIX or Lynx).
Data Type	Read-only. The value is taken automatically from the End Item.

Region

Sample Format: *sample_region*

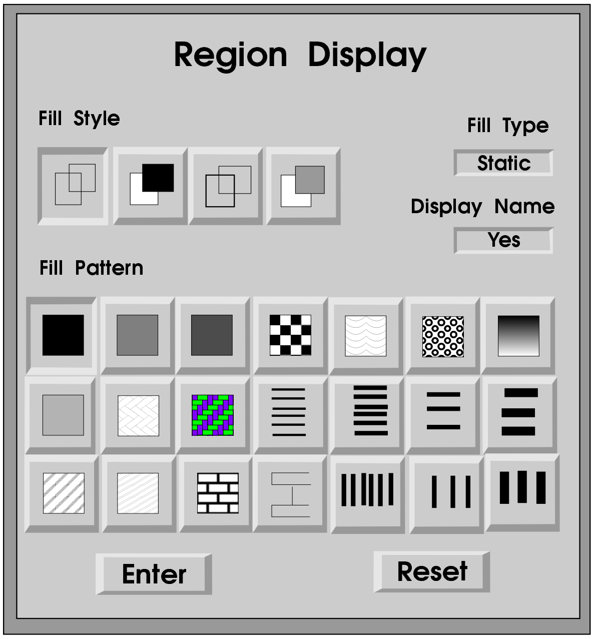
The *Region* display type allows you to define an area, which then can serve as a pre-defined zoom area. You can also set the area's pattern/color fill and visibility. The fill style and pattern can change based on incoming data values from an application; also, runtime annotations can change the foreground and background colors. You can change the visibility through layering and decluttering.

API information

The runtime data buffer requires a long value.

Display type specifications

Enter the following specifications, as illustrated on the panel below.



Region Display

Fill Type: Static

Display Name: Yes

Region Display Entries

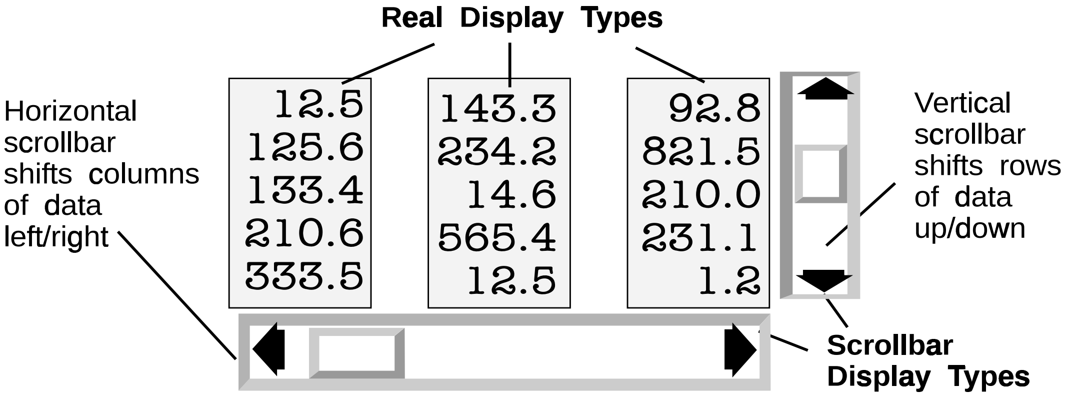
Entry Option	Description
Fill Style	Select a fill style by clicking the mouse SELECT button on one of the following buttons: **No Fill** **Solid Fill** **Transparent Stipple** **Opaque Stipple**
Fill Type	Click the mouse SELECT button in this box to toggle between static and dynamic. If you select Static, the Fill Pattern you set is used. Dynamic will use runtime data annotations to determine the fill type.
Display Name	Click the mouse SELECT button in this box to toggle between whether to display the Region display type name (entered on the DFD Display panel) by selecting Yes or No.
Fill Pattern	Click on the desired fill pattern.

Scrollbar

Sample Format: *ndbm01*

With the *Scrollbar* display type, you can provide any dynamic field with a scrollbar that allows users to change the view. The most common types of display types that could use a scrollbar are data fields which show sets of data and alarm message displays which show lists of messages. A dynamic field which uses a scrollbar is called a target dynamic field.

You could draw dynamic fields large enough to show all data at a glance, but this takes up space. The scrollbar, therefore, is a space-saving device that allows you to show more data in a limited area than would normally fit. The illustration below shows both a vertical and a horizontal scrollbar, but you do not necessarily need both in every situation.



Each scrollbar has a *slider* (not to be confused with the *Slider* display type). This is a moving part of the scrollbar that allow the user to adjust the data display (by dragging it) or page through a data display (by clicking the mouse SELECT button in the area above or below it).

To create a *Scrollbar* display type, you can select the *Scrollbar* icon from the DFD palette, or use the *Add DFD* option from the *Dynamic Fields* menu on the *Format Editor Control* panel and then draw a rectangular dynamic field area that is the same size and in the same position you want the scrollbar to appear.

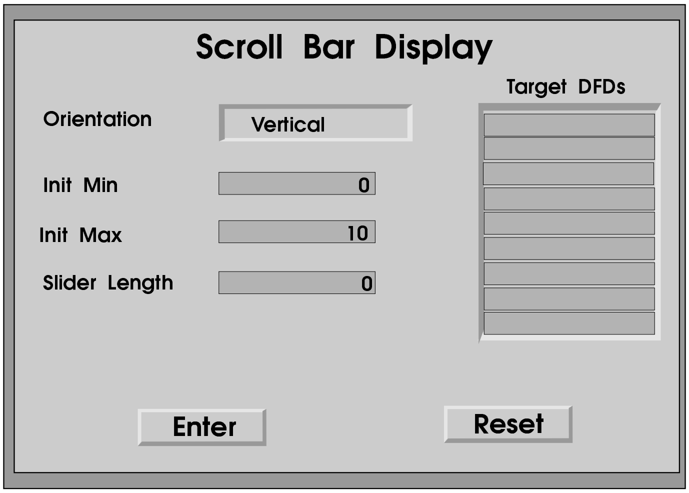
For vertical scrollbars, the dynamic field area should be longer vertically to avoid distortion; for horizontal scrollbars, it should be longer horizontally. The scrollbar is linked to its target dynamic fields by *DFD Names* entered in the specifications for *Scrollbar* display type. For this reason, you can position the scrollbar anywhere on the format and still control the target dynamic field(s) that you specify.

You can have as many scrollbars per format as needed, with up to ten target dynamic fields per scrollbar. However, each target dynamic field can have no more than one vertical and/or one horizontal *Scrollbar* dynamic field controlling it.

A scrollbar dynamic field and its target dynamic field(s) must use the Universal Data Access type, and all must access the same logical server. Also, the *Number of Values* entered in the *Data Access Description* for the scrollbar must be 4 (because applications use four data values, *Offset*, *Min*, *Max*, and *Slider length)*, to control scrollbar positioning).

Display type specifications

Enter the following specifications, as illustrated on the panel below.



Orientation: Vertical

Init Min: 0

Init Max: 10

Slider Length: 0

Scrollbar Display Entries

Entry Option	Description
Orientation	Set the orientation of the scrollbar by clicking the mouse SELECT button in this box to toggle between *Vertical* and *Horizontal*.

Scrollbar Display Entries (continued)

Entry Option **Description**

Init Min/Max

Enter the value where the scrollbar begins (minimum) and the maximum number for items that can be displayed. The values that you enter here restrict the user to accessing all or only part of a data set. These values can be changed dynamically by the application as data are made available to the target dynamic field(s). (These fields can be changed dynamically, check with your API developer for details.)

WARNING: You must factor in the slider length when calculating the Init Max value; add the slider length (set in the next field) to the maximum number of items to calculate an Init Max value. If you do not, you will get unexpected results when scrolling.

Slider Length

Enter the slider length to be used for paging the data in the target dynamic fields (equal to the number of visible columns or rows of data). For example, if the slider length is 4, the data display will shift by four rows at a time during paging. While the slider length can be changed dynamically by an application as data is made available to the target dynamic field(s), this is not recommended. The slider length should always be set to the height (number of rows) or width(number of columns) of the target dynamic field. If it is not set to this value, the scrollbar will scroll past the last data item, or may never reach data items.

Target DFDs

Enter the *DFD Name* of each display type linked to this scrollbar.

Select List

Sample Format: *sample_slist*

The *Select List* display type allows a user to choose or complete an action by selecting from a list of options. An example of the *Select List* display type appears when you use the **add-window** command and press the RETURN key without a format name.

The *Select List* display types can place a selected string of characters (up to 40) into a field, send a command, and so on.

Select List used as an Option List

Another use of the *Select List* display type is as a pop-up option list for other display types, such as *Object Icon*. When the user clicks on the other dynamic field with the mouse OPTION button, the *Select List* display type pops up.

When you attach the *Select List* display type to another dynamic field, that field becomes the “trigger DFD”, since it causes the pop-up action. When used in this way, the popup *Select List* ALWAYS "grabs" input, even if you specify "Grab Focus = NO" when you create the *Select List*.

When used as a pop-up option list, the *Select List* display type can be either a:

- **Command Option List** that sends a command and/or “button events” to an application. The list is attached to the “trigger DFD” by entering the *Select List* in the *Option DFD Name* field and toggling the *Cmnd* field to *Yes* on the *DFD Display* panel for the “trigger DFD”.

  or

- **Character I/O Option List** that places a value in the “trigger DFD.” The list is attached to the “trigger DFD” by entering the *Select List* name in the *Option DFD Name* field and toggle the *Cmnd* field to *No* on the *DFD Display* panel.

  For a *Select List* used as **Character I/O Option List**, any entries in the *Logical Server*, *Format Name*, and *DFD Name* fields are ignored; it is not necessary to enter them. This type of list places a character string in the "trigger DFD."

In either case, the *Select List* does not pop up unless the user has write privilege for the format and “trigger DFD.” (See the ***System Administrator’s Guide*** for more information on security.)

Command entries for Select Lists used as Option Lists

For a *Select List* used as a **Command Option List**, which pops up when the mouse Option button is clicked in a trigger dynamic field, the presence (or absence) of the logical server name causes different actions:

- If a logical server name is present, the command entries associated with the selected item are sent to the specified server. If the logical server is an application, the server is notified that the command data for the selected item is available with the `S2_SEND_CMD` event within the application. If entry in the logical server name is `$local-cmd`, the command items are sent to the *Sammi* Command processor.

- If there is no entry in the *Logical Server Name* field of the *Static Select List Item* in the *Command Entries* panel, the logical server of the "trigger DFD" is notified that the command data for the selected item is available with the `S2_BTN_EVENT` event in the application. In this case, if the "trigger DFD" is not connected to a server, the commands associated with the selected item are discarded.

For more details, refer to ***Appendix C*** of this manual and the ***Application Programming Interface (API) Guide***.

Optional components

You can include the following optional components for a *Select List* display type as desired:

- **Title.** The *Select List* display type may or may not have a title.

- **Scrollbars.** If the list of choices is longer than the window in which they appear, the Select list has a vertical scrollbar which allows the user to search for a specific item. If the number of characters in the choices is greater than the width of the window in which they appear, the Select list has a horizontal scrollbar that allows the user to read across an item. A *Select List* display type can have either, neither, or both kinds of scrollbars. The presence (or absence) of scrollbars is determined by the
Select List display type; you do not have to include a *Scrollbar* display type.

- ***Cancel*** **button**. The *Select List* display type may have a *Cancel* button. Its function depends on whether the *Select List* permits a single choice or multiple choices. See the discussion on ***Single and Multiple Selections*** below for information.

- ***OK*** **button.** The *Select List* display type may have an *OK* button. This button allows you to confirm your choice(s) before the selected action is executed.

- **Standard Select List**. You can enter select list specifications into a command file (`.cmd`) by using an ASCII editor to create a Standard Select Type from the *Select List Display* panel. (For more information on command files, see ***Appendix C Command Files.***)

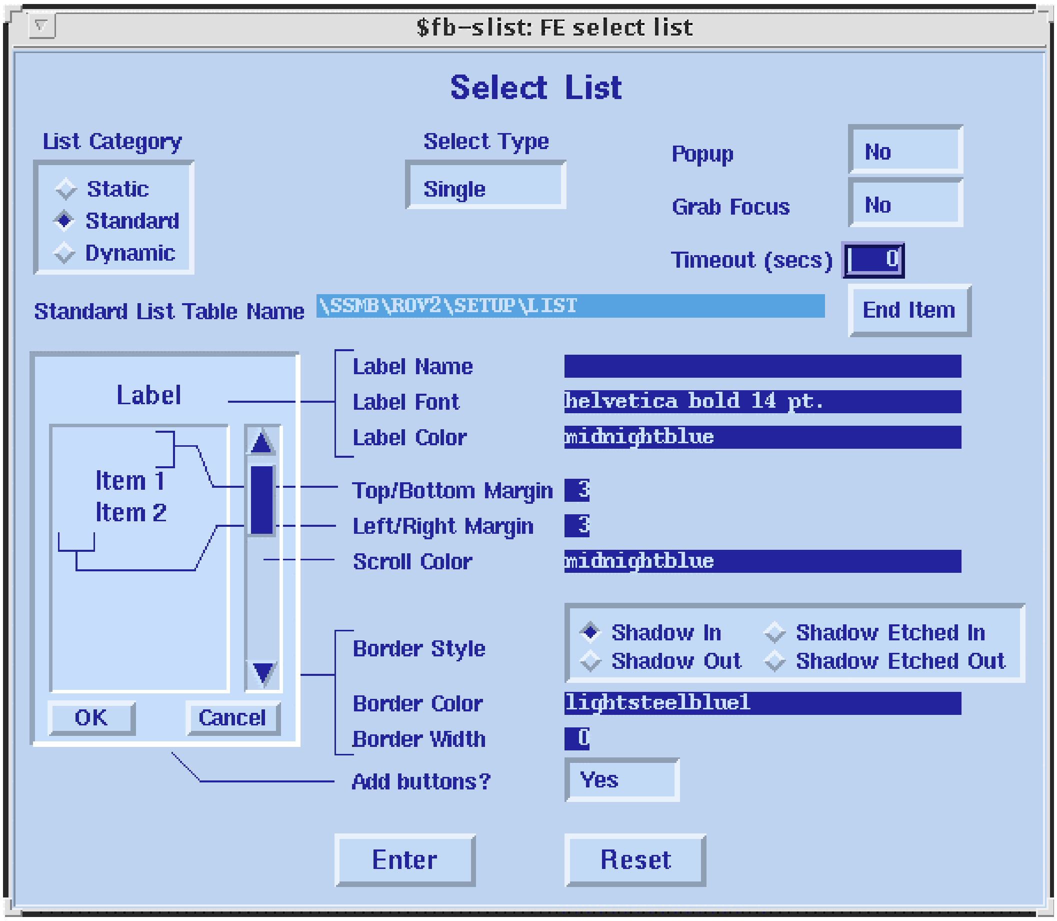
- **Dynamic Select List**. Select List specifications can be sent to the Select List Display type from an application. When the Select List types in the *Select List Display* panel is set to *dynamic*, and you then click the mouse SELECT button, the *Universal Data Definition* panel displays.

Set the Number of Variables field in this panel to the maximum number of entries that the list can ever contain (see ***Chapter 8*** for information about this panel).

NOTE: The Data Access Type in the DFD Display panel must be set to Universal for the Dynamic Select List specification (See ***Chapter 6***).

Display type specifications

Enter the following specifications, as illustrated on the panel below:



$fb-slist: FE select list

Select List

List Category: ◇ Static ◆ Standard ◇ Dynamic

Select Type: Single

Popup: No

Grab Focus: No

Timeout (secs): 0

Standard List Table Name: \SSMB\ROV2\SETUP\LIST

Label Name:

Label Font: helvetica bold 14 pt.

Label Color: midnightblue

Top/Bottom Margin: 3

Left/Right Margin: 3

Scroll Color: midnightblue

Border Style: ◆ Shadow In ◇ Shadow Etched In ◇ Shadow Out ◇ Shadow Etched Out

Border Color: lightsteelblue1

Border Width: 0

Add buttons? Yes

Select List Display Entries

Entry Option — **Description**

List Category

Click the mouse SELECT button on one of the following options:

Static. Define the list elements and commands using the *Static Select List Item–Command Entries* panel that displays next when this type is chosen.

Standard. Define a “Standard List Table” whose elements and commands are included in the command file. (See ***Appendix C*** for information on creating this table.)

Dynamic. An application sends the list elements and commands for this type.

Select Type

Select the type of *Select List* by clicking the mouse SELECT button in this box to toggle between:

Single. Only one choice is allowed.
Multiple. Several choices are allowed. User must click the mouse SELECT button on the *OK* button to indicate completion of choices.

Pop-up

Select whether or not this is to be a pop-up list by clicking the mouse SELECT button in this box to toggle between *Yes* and *No*.

Grab Focus

For a pop-up list, select whether or not the pop-up grabs the input focus. When the *Select List* grabs the focus, the user must make a selection or click the mouse SELECT button on the *Cancel* button before any subsequent action can be taken. Click the mouse SELECT button in this box to toggle between *Yes* and *No*. If a *Select List* is used as an *Option List* inside a trigger DFD, this list will always grab focus.

Timeout (secs)

Enter a value for a time (in seconds) for the pop-up list to remain visible without a selection being made before the list disappears. A timeout of zero requires the user to click the mouse SELECT button on the *Cancel* button or to make a choice from the list for the list to disappear.

Select List Display Entries (continued)

Entry Option	**Description**
Standard List Table Name	Read-only. Use the End Item button to specify an End Item of type FWDU_LIST_TEXT.
Label Name	If you want a title placed at the top of this list, enter the text string here. The text string can be up to 32 characters in length including "new-line" characters. You can lay out the label in as many lines as desired. New lines are specified by entering `\n` anywhere in the text label (`\n` means a new line, and does not print. A double backslash n (`\\n`) is printed as `\n`). For example, you want a two line label, enter the text string as: `\n first line of text \n second line of text \n`. The text string is automatically centered.
Label Font	If you enter a title, either enter a font for the title or click the mouse OPTION button in this box to display a list of choices.
Label Color	If you enter a title, either enter a color or click the mouse OPTION button in this box to display a list of choices.
Top/Bottom Margin	Enter a value in pixels for the top and bottom margins. This number represents the number of pixels down from the top and up from the bottom that the item list displays.
Left/Right Margin	Enter a value in pixels for the left and right margins. This number represents the number of pixels in from the right and from the left that the item list displays.
Scroll Color	Either enter a scroll color or select one by clicking the mouse OPTION button in this box to display a list of choices.
Border Style	For a border width greater than zero, select a border style by clicking the mouse SELECT button on one of the following buttons in this box: **Shadow In** **Shadow Out** **Shadow Etched In** **Shadow Etched Out**

Select List Display Entries (continued)

Entry Option	**Description**

Border Color

For a border width greater than zero, either enter a border color or select one by clicking the mouse OPTION button in this box to display a list of choices.

Border Width

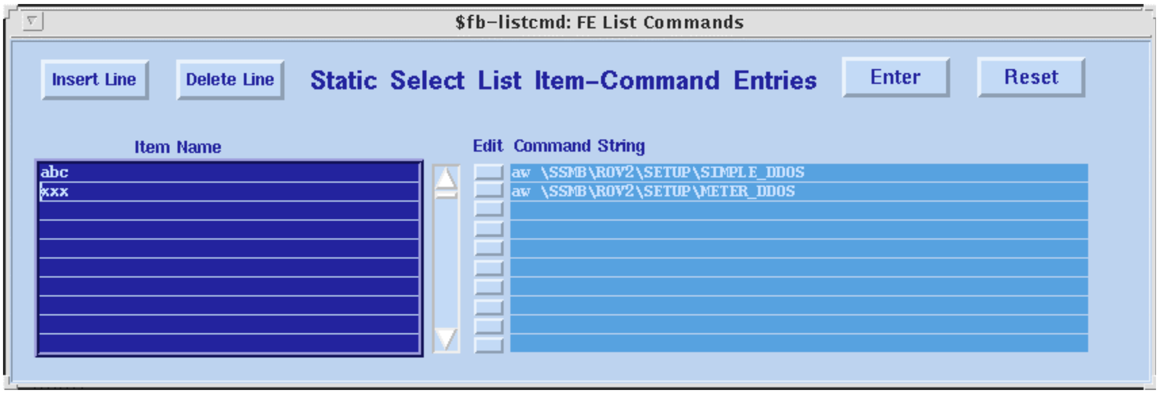
Enter an integer for the number of pixels used for the border width; a zero means no border.

Add buttons?

Select whether or not to add the *OK* and *Cancel* buttons (if this is a pop-up Select list, the *Cancel* button is already defined) by clicking the mouse SELECT button in this box to toggle between *Yes* and *No*.

Static Select List Item: Command Entries

If you selected Static List from the List Category on the *Select List* display panel, when you click the mouse SELECT button on the *Enter* button you will see the following panel:



$fb–listcmd: FE List Commands
Insert Line
Delete Line
Static Select List Item–Command Entries
Enter
Reset

Item Name	Edit	Command String
abc	□	aw \SSMB\ROV2\SETUP\SIMPLE_DDOS
xxx	□	aw \SSMB\ROV2\SETUP\METER_DDOS

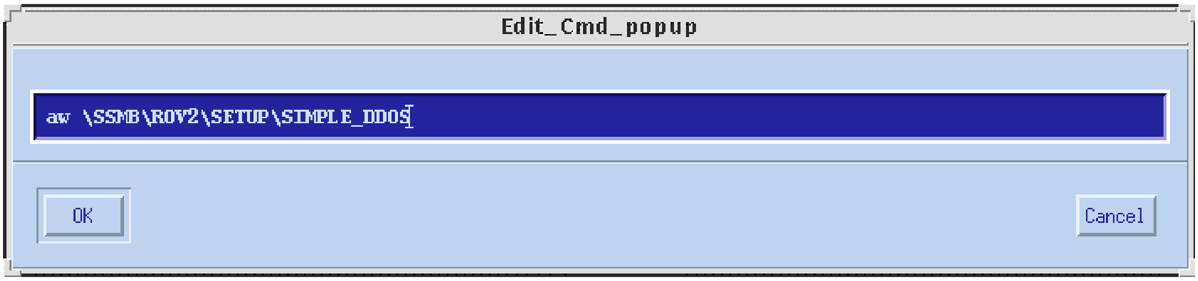
To insert or delete a line from this list, place the cursor where desired and click the mouse SELECT button on the Insert Line or Delete Line button.

Static Select List Item Command Entries

Entry Option	Description
Item Name	Enter the text that will display on the Select list for each option.

Static Select List Item Command Entries (continued)

Entry Option	Description
Command String	FWDU command which is sent to the runtime system. Pressing the Edit button, the following window appears:



```
aw \SSMB\ROV2\SETUP\SIMPLE_DDOS
```

Type in a command and press OK.

Slider

Sample Format: *sample_slider*

The *Slider* display type is an input/output display type similar to a *Scrollbar* display type in appearance, but which functions as a stand-alone type. It can display a data value or allow a user to drag the slider to change a value.

The *Slider* display type can be created as a pop-up or fixed. Fixed *Sliders* are always displayed and available for user selection. Pop-up *Sliders* are displayed when the user picks a dynamic field (such as a button) that pops the *Slider* up or when an application sends a *Sammi* command to pop up the *Slider*.

Pop-up *Slider* display types consist of a slider, and a *Cancel* button which allows the user to close the slider without manipulating the slider. Fixed *Slider* display types consist of an optional label and a slider.

Runtime annotations for the *Slider* display type do not support the extra two characters appended at the end of the value in other dynamic fields at runtime.

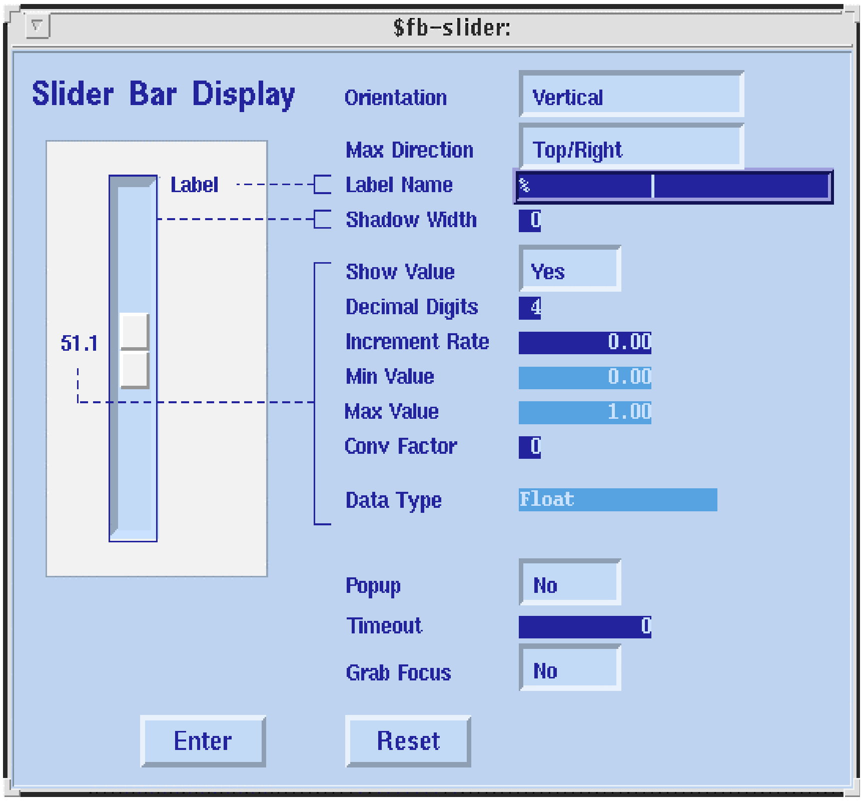
Because the *Slider* display type is a widget, the foreground and background colors will affect the whole widget and not just the value.

API information

The FWDU_SERVER sends only the current value. The limits and measurement End Item type are passed to the FWDU_SERVER at preview and the FWDU_SERVER sends data between max and min.

Display type specifications

Enter the following specifications, as illustrated on the panel below:


$fb-slider:

Slider Bar Display

Orientation: Vertical
Max Direction: Top/Right
Label Name: %
Shadow Width: 0
Show Value: Yes
Decimal Digits: 4
Increment Rate: 0.00
Min Value: 0.00
Max Value: 1.00
Conv Factor: 0
Data Type: Float
Popup: No
Timeout: 0
Grab Focus: No

Slider Display Entries

Entry Option	Description
Orientation	Set the orientation of the slider track by clicking the mouse SELECT button in this box to toggle between *Vertical* or *Horizontal*.
Max Direction	By default, the maximum value of the *Slider* is located to the right of a horizontally-oriented or on top of a vertically-oriented slider; you can invert this location. Click the mouse SELECT button in this box to toggle between a *Top/Right* and *Bottom/Left* placement.
Label Name (optional)	If you want a label for this slider, enter the text string here.
Shadow Width	Enter the width (in pixels) for a shadow border with a three-dimensional effect.
Show Value	Select whether the incoming data value should be

displayed near the slider by clicking the mouse SELECT button in this box to toggle between *Yes* and *No*.

Decimal Digits

If *Yes* was selected for *Show Value,* enter the number of digits to be included to the right of the decimal point in the displayed value (for real numbers only).

Increment Rate

Enter a value, a multiple of which the slider moves when a user clicks above or below the slider in the track area. The user can also “drag” the slider by pointing to the slider itself and holding down the mouse SELECT button while moving the slider along the track with the mouse. The *Increment Rate* does not apply to this situation.

Min Value

Enter a lower limit for the scale.

Max Value

Enter an upper limit for the scale.

Conv Factor

Enter a conversion code for incoming data (see ***Appendix F*** for details).

Min Value

Read-only. Data is automatically taken from measurement End Item when associating measurement End Item.Data is **Engineering Range Low Value.**

Max Value

Read-only. Data is automatically taken from measurement End Item when associating measurement End Item. Data is **Engineering Range High Value.**

Data Type

Read-only. Data is automatically taken from measurement End Item when associating measurement End Item.

Pop-up

Select whether or not this is a pop-up *Slider* by clicking the mouse SELECT button in this box to toggle between *Yes* and *No*.

Timeout (secs)

Enter a value for a time (in seconds) for the Slider to disappear if a selection is not made. A timeout of zero requires the user to click the mouse SELECT button on the *Cancel* button to make the *Slider* disappear.

Grab Focus

For a pop-up *Slider*, select whether or not it grabs the input focus. When the *Slider* grabs the focus, the user must make a selection and/or click on the *Cancel* button before continuing. Click the mouse SELECT button in this box to toggle between *Yes* and *No*.

Symbol Table

Sample Format: *sample_sfs*

The *Symbol Table* display type displays a series of graphic images or *symbols*. These images can give the illusion of movement.

For example, the user might see a valve that opens and closes; a switch that turns on or off, or a spacecraft or aircraft that tracks across the screen. To create motion with a piece of equipment, you can make each graphic symbol nearly identical, except for the moving item. As incoming data causes different symbols to be displayed, the only part of the image that seems to change is the moving item. For motion on an object such as an aircraft, you would move the same graphic to a new set of coordinates.

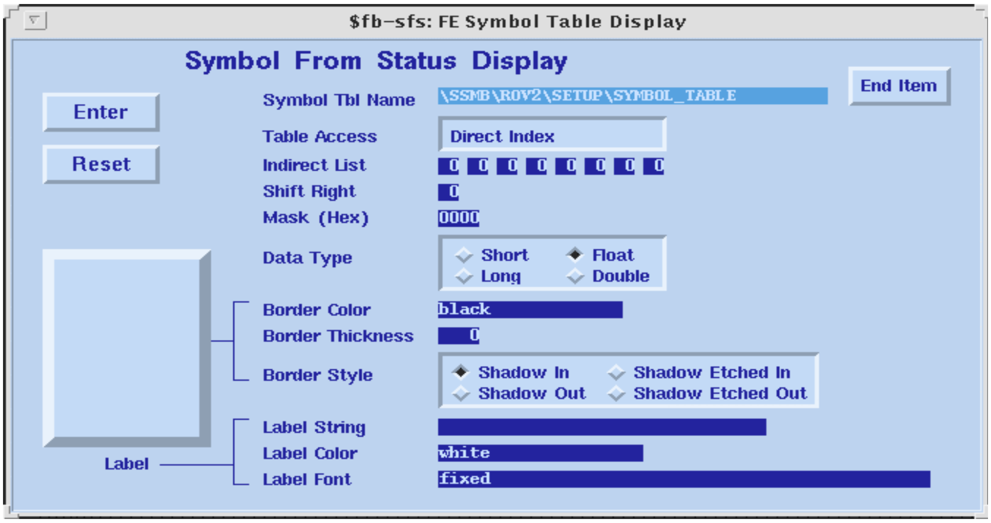
You create (or copy and modify) the symbols using a bitmap editor program capable of producing an *X bitmap file* (most X Window System workstations have generic bitmap editors). Each symbol must be saved as a separate file with a `.sym` suffix and stored in a `$FWDU_HOME/lib` directory. For graphics that will be placed on top of each other, you should make the graphics the same size.

You must also create a lookup table to which incoming data values are compared, which then makes a certain graphic display. Each symbol must be stored as separate End Items of type FWDU_SYMBOL_BITMAP_BINARY. The lookup table shall be stored in the MDB. Lookup table End Item type is FWDU_SYMBOL_TABLE_TEXT and can be edited with a safs editor. Please refer to ***Appendix L*** for a sample file.

Although similar to the *Symbol Table* display type, the *Object Icon* display type is user-selectable.

Display type specifications

Along with creating the desired symbols and the necessary lookup table, you must fill in the *Symbol From Status Display* panel. Enter the following specifications, as illustrated below:



$fb−sfs: FE Symbol Table Display

Symbol From Status Display

Symbol Tbl Name: \SSMB\ROV2\SETUP\SYMBOL_TABLE
Table Access: Direct Index
Indirect List: 0 0 0 0 0 0 0 0
Shift Right: 0
Mask (Hex): 0000
Data Type: ○ Short ● Float ○ Long ○ Double
Border Color: black
Border Thickness: 0
Border Style: ● Shadow In ○ Shadow Etched In ○ Shadow Out ○ Shadow Etched Out
Label String:
Label Color: white
Label Font: fixed

Symbol From Status Display Entries

Entry Option	Description
Symbol Tbl Name	End Item of type fwdu_symbol_table_text.A valid table name must be supplied before saving
Indirect List *(Indirect index-lookup only)*	Enter the list of row numbers to be looked up for final converted values of 0 through 7, as described in the ***Lookup tables and indexing*** section earlier in this chapter.
Mask (Hex) *(Direct index-lookup only)*	Enter the hexadecimal value that is to be bitwise ANDed with the right-shifted data value. If Mask is 0, the incoming data value will not be shifted or masked. See ***Appendix G Shifting and Masking*** for more information.
Shift Right *(Direct index-lookup only)*	Enter the number of bits by which the incoming data value is to be right-shifted (if any). See ***Appendix G Shifting and Masking*** for more information.
Data Type	Select the type of incoming data value being received by the dynamic field by clicking the mouse SELECT button on one of the buttons to the right of this field from one of the following options: **Short** **Long** **Float** **Double**
Border Color	For a border width greater than zero, either enter a border color, or select the border color by clicking the mouse OPTION button in the box to the right of this label.

Symbol From Status Display Entries (continued)

Entry Option **Description**

Border Thickness

Enter the integer number of pixels for a border thickness.

Border Style

For a border width greater than zero, select a border style by clicking the mouse SELECT button on one of the following buttons:

Shadow In
Shadow Out
Shadow Etched In
Shadow Etched Out

Label String (optional)

Enter a string for the text label; this may be up to 32 characters in length, including new-line characters. You may format the label in as many lines as desired. New lines are specified by entering `\n` anywhere in the text label (`\n` when found, is interpreted as a new line and does not print. A double backslash n [`\\n`] is printed as \n). Spacing and margins for the labels are specified as part of the label text. For example, if you want a margin of 1 character on the top, bottom, and sides of the button label with a two-line label, you would specify the label text as:

```
\n first line of text  \n second line
of text \n.
```

Label Color

If you enter a label, either enter a color or click the mouse SELECT button to display a list of choices.

Label Font

If you enter a label, either enter a font for the label or click the mouse OPTION button in this box to display a list of choices.

Tabular

Sample Format: *sample_tabular*

The *Tabular* display type displays data (output only) in a columnar format. It can include an optional title, optional column headings, and optional scroll bars.

Data Definition Record

Sammi uses a *Data Definition Record* (DDR) to define the structure for a runtime data buffer, which this display type uses for data arrangement. You can use any text editor to create a DDR; save the file with an extension of `.ddr`. The Runtime Environment then reads these files at startup.

Before creating a Tabular DFD, you MUST create a `.ddr` file consisting of record definitions; each definition describes the data format of a data buffer passed between the Runtime Environment and an API Application. This allows the Runtime Environment to unpack the data buffer and to format the data for display. Each record definition consists of a series of lines in the format:

```
<record_name> <num_of_fields> <x> <y> <z>
<field_name> <field_type> {data_length_in_bytes}
<field_name> <field_type> {data_length_in_bytes}
.
.
.
<field_name> <field_type> {data_length_in_bytes}
```

where:

`<record_name>`
Name of `.ddr` record; that is, name used in the DFD definition.

`<number_of_fields>`
Number of data items in the data buffer. There will be this number of `<field_name>` lines in the record definition.

`<x> <y> <z>`
Reserved for future use; currently, specify each of these with a value of 1.

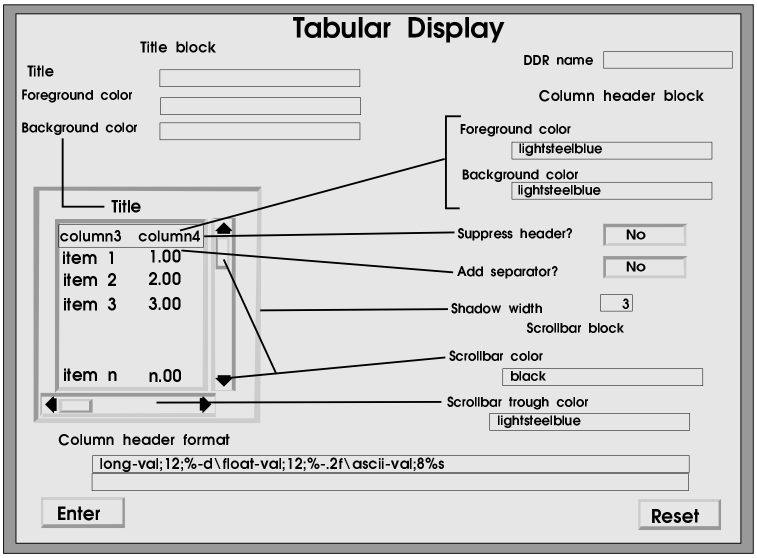
`<field_name>`
Name of the field in this `.ddr` record. This name is arbitrary and is not used by the Runtime Environment; therefore, it is best to make this name as explanatory as possible.

`<field_type>`
The data type of this field. Valid entries are: short, long, float, double, and ASCII.

`{data_length_in_bytes}`
Optional entry needed only for ASCII field types. Specifies the length of the ASCII string in bytes (characters).

Display type specifications

Enter the following specifications, as illustrated in the panel below:



Tabular Display

Title block

Title

Foreground color

Background color

DDR name

Column header block

Foreground color: lightsteelblue

Background color: lightsteelblue

Suppress header? No

Add separator? No

Shadow width: 3

Scrollbar block

Scrollbar color: black

Scrollbar trough color: lightsteelblue

Column header format: long-val;12;%-d\float-val;12;%-.2f\ascii-val;8%s

Tabular Display Entries

Entry Option — **Description**

Title block:

Title (optional)
If you want a title for the output, enter the text string.

Foreground color
If you enter a title, either enter the foreground color or click the mouse OPTION button in this box to display a list of choices.

Background color
If you enter a title, either enter the background color or click the mouse OPTION button in this box to display a list of choices.

DDR name
Enter the record name defined in the Data Definition Record file discussed earlier in this section.

Column header block:

Foreground color
Either enter the foreground color or click the mouse OPTION button in this box to display a list of choices.

B*ackground color*
Either enter the background color or click the mouse OPTION button in this box to display a list of choices.

Tabular Display Entries (continued)

Entry Option **Description**

Suppress header?
Select whether or not to display the column headings by clicking the mouse SELECT button in this box to toggle between *Yes* and *No*.

Add separator?
Select whether or not to display a solid line between the headings and data by clicking the mouse SELECT button in this box to toggle between *Yes* and *No*.

Shadow width
For a three-dimensional effect, enter the width (in pixels) for a shadow border.

Scrollbar color
Either enter a scrollbar color or click the mouse OPTION button in this box to display a list of choices.

Scrollbar trough color
Either enter a scroll bar trough color or click the mouse OPTION button in this box to display a list of choices.

Column header format
Enter column headings, using the following style:

<*col heading*> ; <*width*> ; % <*conversion code*>\

where:

<*col heading*> Enter the string that displays at the top of the column.

<*width*> Enter the width (in characters) of the column.

<*conversion code*> Enter the print conversion code for the column. The conversion codes used to display the tabular information are the same conversion codes used for the C **printf** command. Please refer to any C-programming language manual for more information.

Text

Sample Format: *sample_litrl*

With the *Text* display type, you can display and accept alphanumeric data as input from the user or applications. Unlike other display types, the *Text* display type does not require you to enter additional specifications. Instead, the field uses the default colors and font entered in the *DFD Display* panel (see ***Chapter 6 Dynamic Field Description***).

Text Browser/Browser

Sample Format: *sample_browser*

The *Text Browser Data Input/Output Field* display type basically functions as a single-line or multi-line ASCII text editor. It allows a user to enter/edit text, or receive text from an application or other source.

You can select the source or destination of this ASCII text by using one of three methods:

- **Dynamic.** Loaded by an application.
- **Standard.** Read from a disk file.
- **Static.** Defined at format creation time.

You can also use this to create or modify menu tables, selection list tables, option list tables, or any other text file required by *Sammi*.

NOTE: The *Text Browser* does not scroll properly through files containing the Tab character. Also, it does not support eight bit ASCII characters (languages which require the use of the ISO 8859-1 standard.

The *Text Browser Data Input/Output Field* display type features:

- A three-dimensional appearance.
- An optional multi-line label at the top.
- Optional *File*, *Write*, and *Cancel* buttons.
- Optional scroll bars. You can set scroll bars to appear or let *Sammi* automatically determine whether the data requires scrollbars and add them.

You can also specify the Text Browser as a pop-up display type.

API information

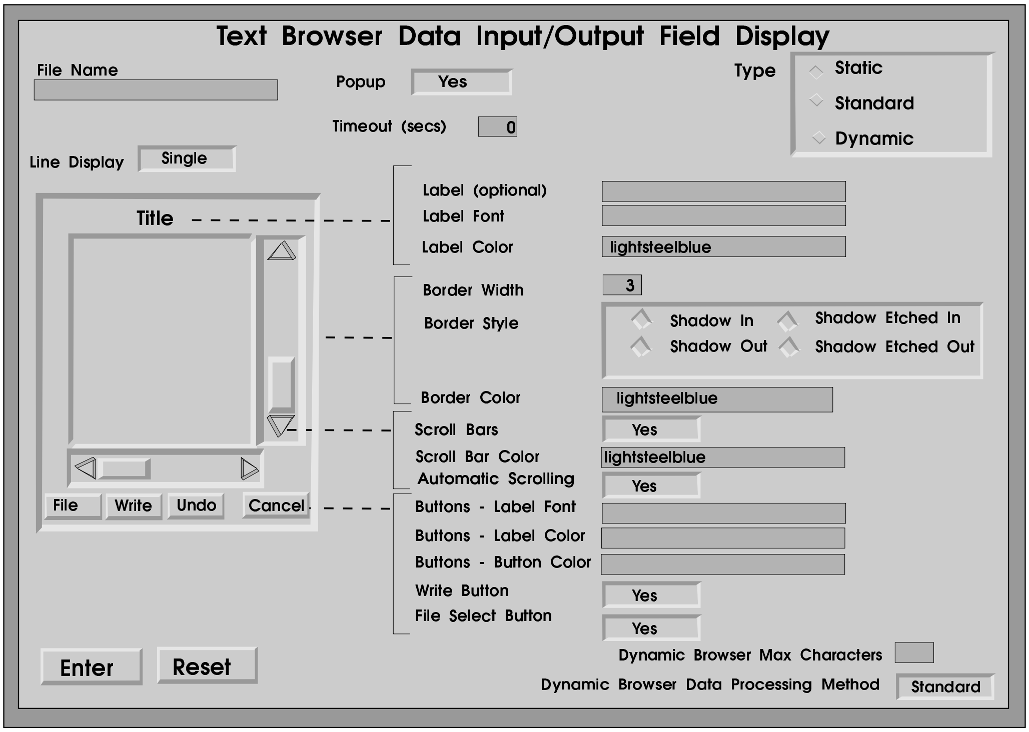
Dynamic browsers set with a Universal data access type support two data processing methods for the data sent to it by an application: Standard and Special.

With the Standard method, data is not processed before the browser displays it. Line feed characters should be inserted in the data by the application wherever line breaks are desired. The Dynamic Browser Max Characters on the Text Browser Data Input/Output Field Display panel should be set to represent the maximum number of characters to be sent to the browser with line feeds included.

Special is included only for backwards compatability with applications developed to support browsers in Release 2.0 of *Sammi*.

Display type specifications

Enter the following specifications, as illustrated in the panel below:



Text Browser Data Input/Output Field Display

File Name

Popup: Yes

Timeout (secs): 0

Line Display: Single

Type: ◇ Static ◇ Standard ◇ Dynamic

Label (optional):

Label Font:

Label Color: lightsteelblue

Border Width: 3

Border Style: ◇ Shadow In ◇ Shadow Etched In ◇ Shadow Out ◇ Shadow Etched Out

Border Color: lightsteelblue

Scroll Bars: Yes

Scroll Bar Color: lightsteelblue

Automatic Scrolling: Yes

Buttons - Label Font:

Buttons - Label Color:

Buttons - Button Color:

Write Button: Yes

File Select Button: Yes

Dynamic Browser Max Characters:

Dynamic Browser Data Processing Method: Standard

Text Browser Data Input Output Field Display Entries

Entry Option — **Description**

File Name

If you select *Standard* type (see the description for *Type* below), enter a file name.

Pop-up

Select whether or not this is a pop-up text browser by clicking the mouse SELECT button in this box to toggle between *Yes* or *No*.

Type

Click the mouse SELECT button on one of the following:

Static. Enter the text that is to be displayed, using the *Static Browser Data Display* panel that appears if you select this type and then complete this panel.

Standard. The data is read from a disk file.

Dynamic. An application sends the data for browsing.

Text Browser Data Input Output Field Display Entries (continued)

Entry Option **Description**

Line Display

Select whether to display single or multiple lines by clicking the mouse SELECT button in this box to toggle between *Single* and *Multiple*. You can create a single line Browser, with no scroll bars, buttons, etc., that will send its data when the Return key is pressed; choose Single for the Line Display option and No for the Scroll Bars option. (If you allow scroll bars, then you must add a Write button to the DFD.)

Timeout (secs)

If you select pop-up, enter a time (in seconds) for the pop-up to remain on the screen before it disappears. Entering zero means no timeout; this requires the user to click on the *Cancel* button to close the pop-up *Text Browser* window.

Label (optional)

If you want a label for this browser, enter the text string here. You may format the string in as many lines as desired. New lines are specified by entering `\n` anywhere in the text (`\n` when found, is interpreted as a new line and does not print. A double backslash n [`\\n`] is printed as \n). Spacing and margins for the string is specified as part of the string. For example, if you want a margin of 1 character on the top, bottom, and sides of the string with a two-linestring, you would enter:

```
\n first line of text  \n second line
of text \n.
```

Label Font

If you enter a label, either enter a font for the label or click the mouse OPTION button in this box to display a list of choices.

Label Color

If you enter a label, either enter a color or click the mouse OPTION button in this box to display a list of choices.

Border Width

Enter an integer for the number of pixels used for the border width; a zero means no border.

Text Browser Data Input Output Field Display Entries (continued)

Entry Option **Description**

Border Style

For a border width greater than zero, select a border style by clicking the mouse SELECT button on one of the following buttons:

Shadow In
Shadow Out
Shadow Etched In
Shadow Etched Out

Border Color

For a border width greater than zero, either enter a border color or click the mouse OPTION button in this box to display a list of choices.

Scroll Bars

You can optionally select to use scroll bars. Click the mouse SELECT button in this box to toggle between *Yes* and *No*.

Scrollbar Color

Either enter a color for the scrollbar or click the mouse OPTION button in this box to display a list of choices.

Automatic Scrolling

This option controls whether or not the *Text Browser* scrolls as you enter data beyond the width or length of the Browser's text area. When data updates occur, the Browser maintains the position of text and does not scroll back to the top; however, if Automatic Scrolling is enabled, the Browser will blink when updated. Click the mouse SELECT button in this box to toggle between *Yes* and *No*.

NOTE: The following entries are used only if you add the optional buttons.

Buttons-Label Font

Either enter a font for the labels or click the mouse OPTION button in this box to display a list of choices.

Buttons-Label Color

Either enter a color or click the mouse OPTION button in this box to display a list of choices.

Buttons-Button Color

Either enter a color or click the mouse OPTION button in this box to display a list of choices.

Write Button

Add this button, which allows the user to write the data after changes by clicking the mouse SELECT button in this box to toggle between *Yes* or *No*.

Text Browser Data Input Output Field Display Entries (continued)

Entry Option **Description**

File Select Button

Add this button to display a file selection dialog box which allows the user to save the file to a new location or under a new name.

Dynamic Browser Max Characters

Enter the maximum number of characters that are retrieved from the runtime buffer during a refresh cycle. If the text does not contain any return characters (\n), it displays as one long line. Trailing blanks are stripped to the last printable character.) This entry applies only when you select the Dynamic type (see *Type* above).

Dynamic Browser Data Processing Method

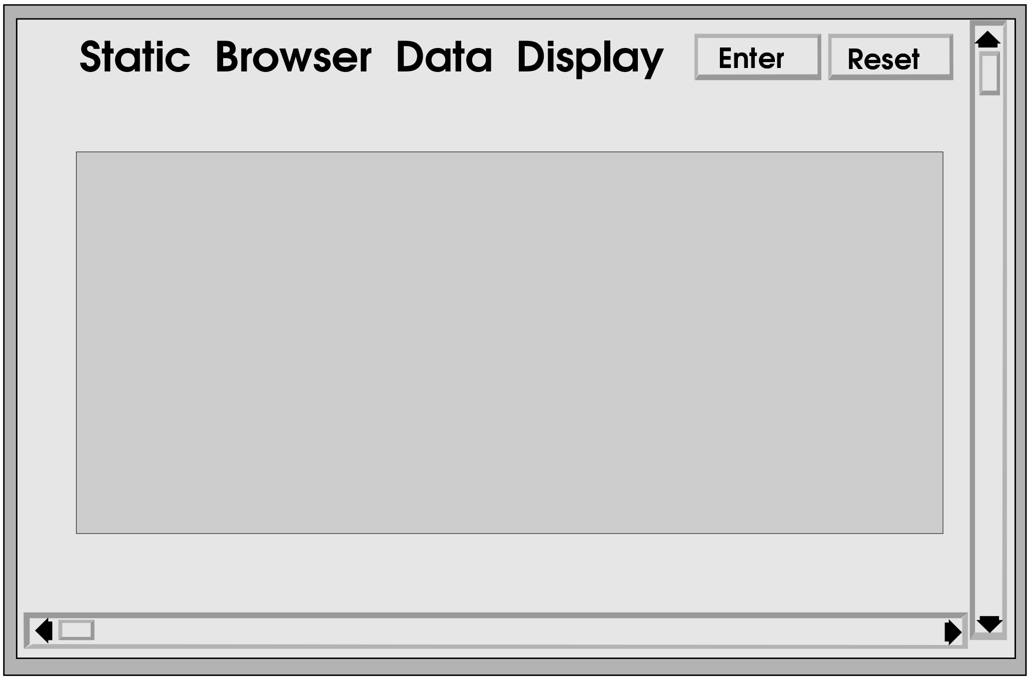
This function is provided for backwards compatability with browsers created in Release 2.0. You most likely should set this as Standard, which means an application provides the maximum characters of data that is formatted with carriage returns. Special should only be used with applications designed to provide data in a different manner; please consult your API developer for details. Click the mouse SELECT button in this box to toggle between the following options:

Standard
Special

Static Browser Data Display panel

If you choose the *Static f*or the type on the *Text Browser Data Input Output Field Display* panel, the following panel appears when you click the *Enter* button:

This panel is completely free form; whatever you enter in the box will display whenever the *Text Browser* displays.



Text Table

Sample Format: *sample_afs*

The *Text Table* display type shows messages that change depending on the value of incoming data. For example, the message in this display type might say “Tank is FULL” which later changes to “Tank is EMPTY.”

Displayed messages are limited by the width of the dynamic field in characters, so you must be careful to make the dynamic field as wide as the longest message to be displayed (see ***Chapter 6 Dynamic Field Description***).

The lookup table shall be stored in the MDB. Lookup table End Item type is FWDU_SYMBOL_TABLE_TEXT and can be edited with a safs editor

The Runtime Environment knows which message to display by comparing the incoming data value to the lookup table. The examples below show two different formats that you can use for the lookup table.

Value Lookup Method:

```
TEXT value-lookup
     0.00 “CRITICAL:  fuel tank is empty!!”  red   blink
     0.10 “WARNING:  fuel is low!!”          red   white blink
     0.11 “Fuel tank is less than half full.”green white
     0.50 “Fuel tank is over half full.”     green white
     0.90 “Fuel tank is over 90% full.”      blue  white
     1.00 “Fuel tank is full.”               blue  white
```

Index Lookup Method:

```
TEXT index-lookup
     “Display me if table index is 0.”    red      white  blink
     “Display me if table index is 1.”    orange   white
     “Display me if table index is 2.”    magenta  white
```

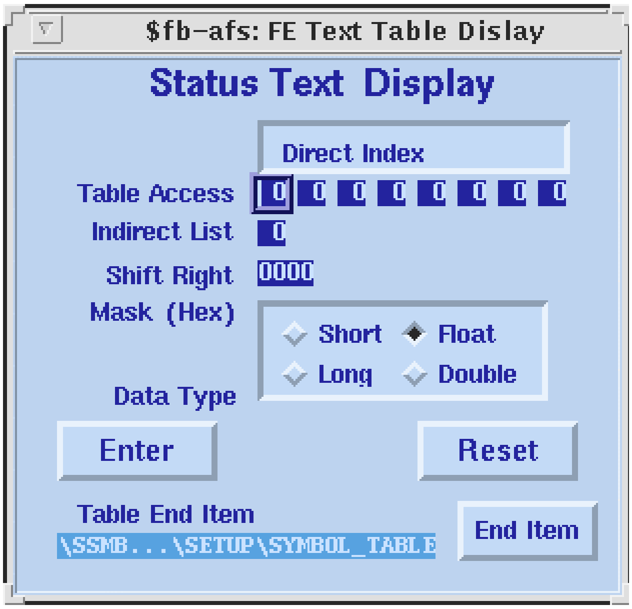
Each example above has a title line indicating the lookup method being used, followed by each of the messages to be displayed in the dynamic field (in quotation marks) and corresponding foreground/background colors. You can also set the message to blink by adding the word "blink" at the end of the line.

The value-lookup method includes a numeric value as the first entry in each row of the table, whereas the index-lookup method does not. See the ***Lookup table and indexing*** section earlier in this chapter for a complete explanation of these lookup methods.

Display type specifications

In addition to creating a lookup table, enter the following specifications on the *Status*

Text Display panel, as illustrated below:



$fb-afs: FE Text Table Dislay

Status Text Display

Table Access: Direct Index 0 0 0 0 0 0 0 0

Indirect List: 0

Shift Right: 0000

Mask (Hex)

Data Type: ◇ Short ◆ Float ◇ Long ◇ Double

Table End Item: \SSMB...\SETUP\SYMBOL_TABLE

Status Text Display Entries

Entry Option	Description
Text Table Name	End Item of type FWDU_SYMBOL_TABLE_TEXT.
Table Access	Select the method of access to be used with the index-lookup method. See the ***Lookup table and indexing*** section earlier in this chapter for details. Click the mouse SELECT button on this box to toggle between the following options: **Direct Index** **Indirect Index**
Indirect List *(Indirect index-lookup only)*	Enter the list of row numbers to be looked up for final converted values of 0 through 7 (see the ***Lookup table and indexing*** section earlier in this chapter for details).

Status Text Display Entries (continued)

Entry Option **Description**

Mask (Hex)
(Direct index-lookup only)

Enter the hexadecimal value that is to be bitwise ANDed with the right-shifted data value. If Mask is 0, the incoming data value will not be shifted or masked. See ***Appendix G Shifting and Masking*** for more information.

Shift Right
(Direct index-lookup only)

Enter the number of bits by which the incoming data value is to be right-shifted (if any). See ***Appendix G Shifting and Masking*** for more information.

Data Type

Select the type of incoming data value being received by the dynamic field. Click the mouse SELECT button on one of the following options:

Short
Long
Float
Double

CHAPTER 8 Data Access Types

Dynamic fields accept user input and interpret/display incoming data from a variety of sources, providing *Sammi's* real-time monitoring and control capabilities. The last two chapters have described general functions of dynamic fields and how to change the way they display data. This chapter shows how to link dynamic fields to live data sources.

This link is made through a *data access type* that forms part of the dynamic field description, which you can select on the DFD Display panel. The *Sammi* data access types are:

- Curve Set— used exclusively for the Curve Set display type; it is a subset of the Universal type (see below).
- LCL (local)— used for dynamic fields that receive their data from a local data source (such as other dynamic fields, file input, static data tables, or window application procedures), and Alarm DFDs.
- NOP (no operation)— used by the display types General Action Button (GAB), GAB Group and Equations; or, this type is used by the *Sammi* format conversion utility when it reads a dynamic field on an ASCII format file that contains an obsolete or unknown data type.
- Time— used for the Custom Time display type.
- Universal— used to connect dynamic fields to API-created data sources.

This chapter details each data access type; it also explains how to set up the *Data Access Description* panel for dynamic fields that use the *Universal* data access type. Another function described in this chapter, runtime keys, allows a format designer to supply a generic variable for which a user can substitute a specific variable during runtime.

In general, you can use the local and universal data access types with any dynamic field. However, only those dynamic fields with a data access type of universal (or Curve Set for Curve Set display types only) can communicate with an API-created application.

Some dynamic fields impose restrictions on the data access type that you can use for them. If you specify an invalid data type, the Format Editor displays a warning message. For example, Static Select Lists and Static Menus can expect a local data type, while Dynamic Menus expect a universal data type.

Refer to the following sections for more information on each data type.

NOTE: The information in this chapter pertains only to the five data access types shown above. *Sammi* data access types designed for specific client applications are not described in this manual.

Curve Set

This data type is a specialized version of the universal data type and is used exclusively for Curve Set display types. Please refer to the ***Curve Set*** section in ***Chapter 7*** for more details.

LCL (Local)

Dynamic fields that get their data from local sources use the local data access type; these sources can be:

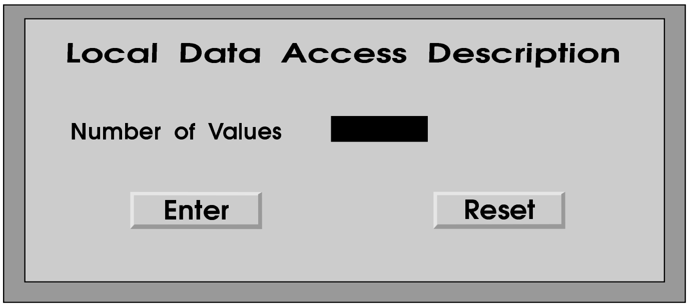
- other dynamic fields,
- alarms,
- file input (used by Text and Text Browser display types, for example),
- static data tables (used by Static or Standard Menus and Select Lists, for example,

  or
- window application procedures (procedures that manage specific formats, developed using the optional *Sammi* Development Kit).

As an example of a dynamic field using another dynamic field as its data source, think of the command line in the *Sammi* Command window; it is a dynamic field that gets its input from the pull-down menus on the same window. When you select the *Add Window** function, the menu option sends the words **add-window** to the command line. The *Equation* display type also uses the local type, since data values from other dynamic fields serve as input to the equation.

If you assign a local data type to a dynamic field but the field does not have a local data source (usually a window application procedure defined with the *Sammi* Development Kit), the dynamic field will work but not in the way expected. For example, if you set a scrollbar as a local data type, you can scroll the scrollbar, but it will not move anything in the format.

When you select local, you can enter the number of desired values for the dynamic field to accept. Enter this information in the *Local Data Access Description* panel, shown below:


Local Data Access Description

Number of Values

NOP (No operation)

NOP is primarily used by the display types General Action Buttons (GABs) and GAB Button Group. For details, refer to the relevant section on each display type in ***Chapter 7***).

Formats can be transferred between platforms or from an earlier release of *Sammi* to the latest one. A conversion utility, `fmt_unload`, is used on the original platform or *Sammi* release to create an ASCII format file from a format. This file can be moved to the target platform or new *Sammi* release using another conversion utility.

When `fmt_load` reads an ASCII format file that contains an obsolete or unknown data access type for a dynamic field, it sets the type as NOP. You can change NOP to another data type, if necessary.

Time

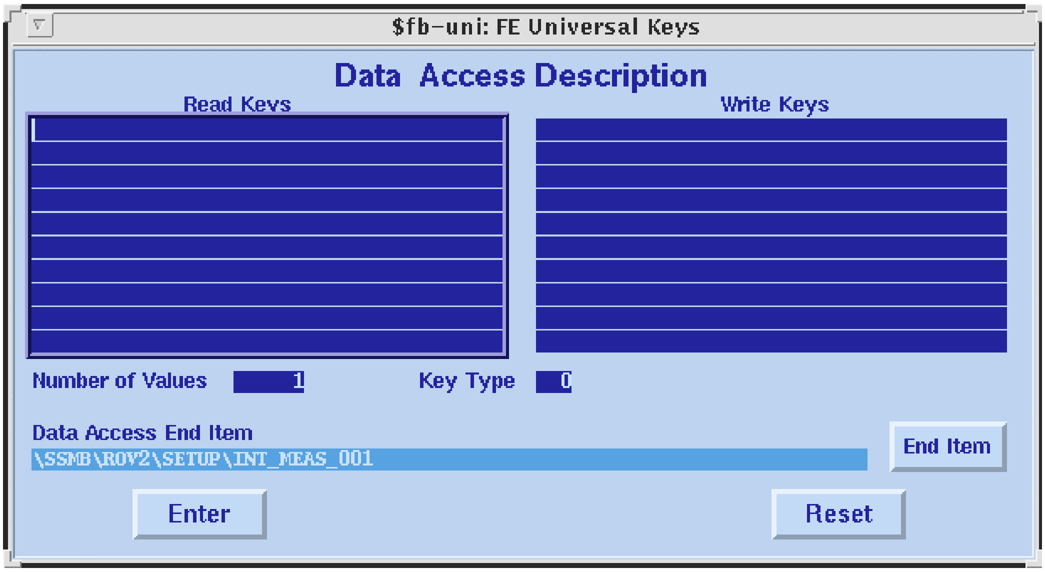
This data type is used only by dynamic fields that use the Custom Time display type. The access type links the dynamic field to the system clock, which provides the time in the form of an integer value. This value is the number of seconds since midnight (Greenwich Mean Time) of January 1, 1970. The number is used internally by the Custom Time Display Object to calculate and display the current hour, minute, and second in any time zone, as well as the current date.

Universal

The universal data access type is used to link dynamic fields to remote data sources through the Application Programming Interface (or API, an optional *Sammi* component).

To link a dynamic field to a remote source, you must enter information in a *Data Access Description* panel, shown below:

This panel appears automatically when you select *Universal* as the data access type on the *DFD Display* panel (refer to ***Chapter 6*** for details). Usually, the API developer or system administrator for your site will supply you with the information that must be entered in this panel.



Number of Values 1

Key Type 0

Data Access End Item \SSMB\ROV2\SETUP\INT_MEAS_001

Data Access Description Entries

Entry Option	**Description**
Read Key	Never used by the FWDU.
Write Key	Never used by the FWDU.

Data Access Description Entries (continued)

Entry Option	Description
Number of Values	With this field, you can indicate how many values you want to access for this DFD if more than one is desired. For example, if you enter five, the application accesses five values.

Often, the type of DFD can dictate how many values are required. Many dynamic fields (other than those used to display datasets) can accept multiple values even though your format only displays one value at a time. These values can include high and low limits, thresholds, and quality words (also known as runtime annotations).

For example, if the application is setting the high and low limits when it sends the current value, the *Number of Value* entry is "3": the *Current Value,* the *Scale Minimum*, and the *Scale Maximum.* For more detailed information on each display type, refer to the desired ***API specifications*** section in ***Chapter 7*** of this guide.

NOTE: If multiple values are accessed in a database and any of the values do not match the display type (real, text, integer, etc.), the results can be unpredictable.

To use this capability, you must enter a number for *Number of Values* that corresponds to the DFD values. Check with your system administrator or API developer for details.

In order for all data set values to be simultaneously displayed in the dynamic field, the DFD height (in characters) that you entered on the *DFD Display* panel should equal the number entered here. If the application returns more values than can be displayed in a dataset, the values are not displayed.

Data Access Description Entries (continued)

Entry Option	Description
Key Type	This field can be used to distinguish between different modes of data access for certain applications. For example, one key type might let you access every data value, while another might let you access every *other* data value. Check with your site’s API developer to find out if this field is supported. If not, leave it zero (0).
Data Access End Item	An End Item. Use the End Item button to change this field.

WARNING: If two or more DFDs on the same format access the same logical server, those DFDs must be set as the same Refresh Type, either Poll or Stream (on the respective DFD Display panels) .

Remember, if you are not sure of the correct entries for this panel, ask your system administrator and/or API developer for assistance.

Sammi is provided with contributed software applications that you can use to test formats. For a description of these applications, please refer to the ***Contributed Software Guide***.

Using runtime keys

Runtime keys function as generic variables for which a user can substitute specific values; they basically keep you from having to "hard-wire" a specific reference to a data item. This is useful if you do not know the specific variable when creating a format, or when required to link multiple versions of the same format to different data sources.

You can use runtime keys in the Data Access Description panel’s read key, write key, and logical server fields. Also, you can use runtime keys within command strings generated by General Action Button, Menu, and Select List DFD types (for details, refer to the relevant section on each display type in ***Chapter 7***).

Creating runtime keys

Use a runtime key to specify a variable for all or parts of a desired item. For example, you can replace all of a read key using a runtime key or just part. You can also specify multiple runtime keys in the field for the desired item.

To specify a runtime key, type the @ symbol followed by a name for the runtime key. For example, type @station1 in a read key field. Later, a user can set the key station1 to equal a specific variable such as "controller32".

Placing a space after a runtime key acts as a delimiter; it ends the runtime key statement. Thus, you cannot use spaces in a runtime key name unless you use double quotes ("") to enclose that space. You can also use non-alphanumeric characters as delimiters. For example, you can use a period as a delimiter to specify the following runtime keys:

```
@DIVISION.@DEPARTMENT.@USER
```

At runtime, these keys can be replaced by:

```
KINESIX.DEVELOPMENT.CASEY
```

To use non-alphanumeric characters as part of the runtime key name (without including it as a delimiter), use the backslash character.

The backslash is also useful to send a read (or write) key that uses a runtime to an API-created application without replacing the runtime key. For example, entering:

```
station1\@sun2
```

does not replace the runtime key @sun2 with its designated runtime key variable, since the backslash is placed before the @ symbol; the entire read key is sent to the application.

Runtime keys can be grouped together into a unit called a session. Creating a session allows you to manage runtime key sets as one; you can then assign or reassign a session to a format or formats. For more information, refer to the ***Combining runtime keys into sessions*** below.

Substituting variables for runtime keys

Several *Sammi* commands allow users to manipulate runtime keys: **add-window**, **format-session**, **session**, and **set-runtime-key**. For more information on these, please refer to the ***Command Reference***.

A user can also display a format for setting runtime keys, called the Session Manager. Refer to the next section for details on this format.

Combining runtime keys into sessions

You can group runtime keys together into a unit called a session. *Sammi* is supplied with a generic session, or a group of runtime keys not grouped into any other sessions. Users can add as many sessions as desired.

A user can access the Session Manager in the Runtime Environment to create and remove sessions and add, delete, and modify a session's associated runtime key values.

You can create two types of sessions: transient and permanent. A transient session only exists when one or more formats is attached to it. A permanent session exists even if no formats are attached to it.

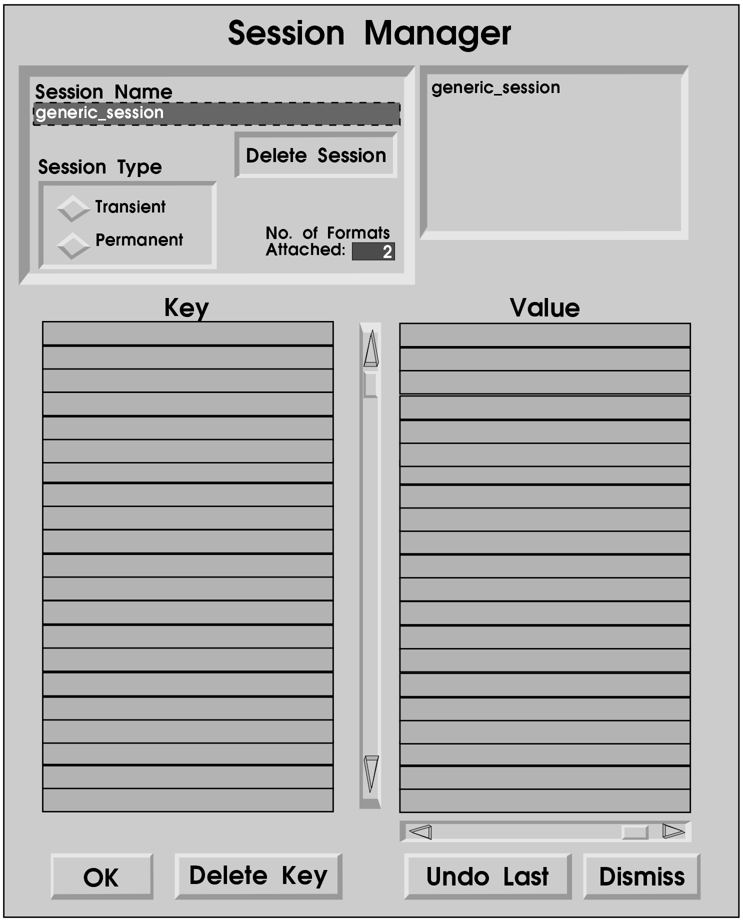
A session operates using these rules:

- When a format is added, any runtime keys in its DFD readkeys, writekeys, or logical server field are evaluated, first by searching the format's session, then by searching the generic session.
- Any format added to the screen as the result of the paging command must be a part of the "parent" format's session. This means that if the initial format has other formats associated with it that are accessed through paging, the other format(s) are a part of the same runtime key values as the initial format.
- Any format added as a replacement for another format using the **replace-window** command also inherits the initial format's session.
- Any format added to the screen as the result of a push button may inherit its parent format's session. This relationship is created by the format designer using the Format Editor.
- The user can modify runtime keys for a session while in the Runtime Environment; (that is, change the value to which the runtime key refers). All formats which are attached to that session are automatically assigned to receive the new runtime key values.
- The user can add duplicates of the same format to different sessions in the Runtime Environment; the runtime keys associated with the initial format are changed to the values for the respective session.

To use the Session Manager, enter the following command in the *Sammi* Command Line:

```
add-window $session
```

The Session Format Manager is displayed; enter the following specifications, as illustrated below. When done, click the mouse SELECT button on OK or press the Return key:



Session Manager

Session Name: generic_session

No. of Formats Attached: 2

generic_session

Session Manager Entries

Entry Option **Description**

Session Name
Name of the current session. A new session can also be created by entering the name in the field.

Session List
Displays all currently-available sessions. To select a new session, click on the name of the desired session on this list; the name will be placed in the Session Name field.

Session Type
Displays the type (transient or permanent) of the current session. The user may change the session type by clicking the desired type and then pressing the OK button.

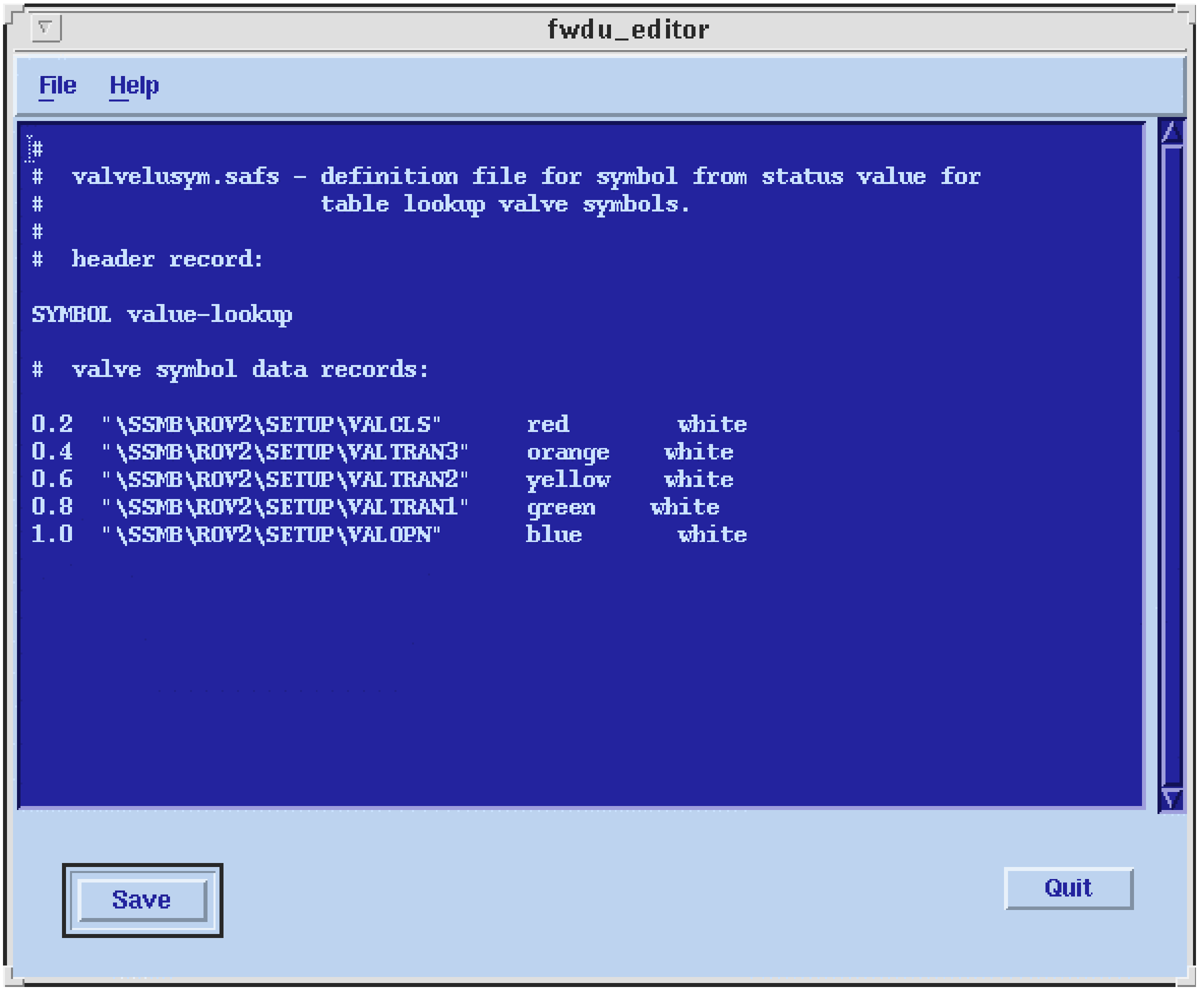
Session Manager Entries (continued)

Entry Option	**Description**
Delete Session	Select a session, then click this button to remove that session.
No. of Formats Attached	Lists the number of formats attached to the current session.
Key	A set of fields listing each runtime key for the current session; you can enter or change the keys displayed in these fields. Runtime keys are sorted in ASCII order.
Value	A set of fields listing the values assigned to their related runtime keys; you can enter or change the values displayed in these fields.
OK	Apply all changes to the Session Manager.
Delete Key	Remove the selected runtime key and its value.
Undo Last	Reset the latest runtime key if deleted.
Dismiss	Delete the window.

NOTE: The generic session cannot be deleted.

The Editor Basics

The FWDU Text Editor is a simple text editor which reads and saves text files to the mission database. At save time some syntax checking is done and sometimes parts of the text is converted.



```
#
#  valvelusym.safs - definition file for symbol from status value for
#                    table lookup valve symbols.
#
#  header record:

SYMBOL value-lookup

#  valve symbol data records:

0.2  "\SSMB\ROV2\SETUP\VALCLS"      red       white
0.4  "\SSMB\ROV2\SETUP\VALTRAN3"    orange    white
0.6  "\SSMB\ROV2\SETUP\VALTRAN2"    yellow    white
0.8  "\SSMB\ROV2\SETUP\VALTRAN1"    green    white
1.0  "\SSMB\ROV2\SETUP\VALOPN"      blue      white
```

The editor has two buttons:

- Save - for storing the current text in the mission database.
- Quit - for closing the current FWDU Text Editor session.

Text Editor Operations

The following describes how to use the text editor's functionality:

Invoke To start the editor you have to invoke it from the I_MDB. Se the I_MDB manuals for details.

Quit To terminate the current session then press on the *Quit* button. This terminates the current session.

Save When a text needs to be saved to the mission database then simple press on the *Save* button. Pressing Save can result in an error message. Read the message and proceed according to the recommend action.

Hints and Tricks

When using the editor you can use the following functionality:

Cut/Paste You can use the standard operating system copy, cut, and paste. The buttons for this are located on the left side of the keyboard. Highlight the text you want to cut or paste and then press on the wanted key. Place the cursor and paste the text. You can also combine this with other tools that support the operating system cut and paste functionality.

Save As There is no Save As functionality built into the editor. Instead of Save As you can take a copy of the wanted End Item in the I_MDB and then invoke the copy.

Undo If you do not want to save a text you just have modified then simply quit without saving.

Pathnames When a pathname is typed in the path is checked at save time.

Syntax Depending on the End Item type parts of the syntax will be checked at same time. But because the End Item can be saved it does not guarantee that the syntax is correct. Always test the End Item in it’s correct environment after it has been created or modified.

Supported End Items

Use the FWDU Text Editor for modifying the following End Items:

- FWDU_HELP_TEXT - Simple text
- FWDU_SYMBOL_TABLE_TEXT - See APPENDIX L
- FWDU_DYNAMIC_OBJECT_TABLE_TEXT - See APPENDIX K
- FWDU_LIST_TEXT - See APPENDIX C
- FWDU_CONVERSION_TEXT - See APPENDIX F
- FWDU_DATA_DEF_RECORD_TEXT - See Tabular DDO
- FWDU_EQUIPMENT_CONSTRAINTS_TEXT - See the following text

Equipment Constraints

In this section the equipment constraints End Item is described. The equipment constraints End Item is of type FWDU_EQUIPMENT_CONSTRAINTS_TEXT.

There has to be one and only one of these End Items in each CDU.

The End Item has to include three lines as defined below.

X_SIZE <*a number*> Maximum horizontal size of display. The size is used to check that displays do not exceed the limits.

Y_SIZE <*a number*> Maximum vertical size of display.

FWDU_PREDEFINED_ITEMS <*pathname*>

Pathname to the pre-defined items library. This pathname will be added to the cross reference list.

Besides the above a definition of the pre-defined commands will also be included in the equipment constraints.

COMMAND_LIST BEGIN Start definition.

“<a command>” One line for each command. Any number of commands can be added here.

...

END End the definition.

Example of a Equipment Constraint End Item

```
# Example of Equipment Constraints
# Taken from the FWDU qualification data
X_SIZE 640
Y_SIZE 480
FWDU_PREDEFINED_ITEMS \OPS\LIBRARY

# Pre-defined commands list
COMMAND_LIST BEGIN
 “ANNOTATE”
 “HELP”
 “EXIT”
 “MARK”
 “MUR”
 “LIMITS”
END
```

Standard Colors

The standard X Window System colors are listed below. You can usually select these colors from a pop-up option list when using the Format Editor. If a pop-up option list is not available, you must type the color names as shown below.

0	black	21	salmon
1	white	22	sienna
2	red	23	brown
3	green	24	sandybrown
4	blue	25	gold
5	cyan	26	goldenrod
6	magenta	27	khaki
7	yellow	28	tan
8	aquamarine	29	thistle
9	mediumaquamarine	30	wheat
10	turquoise	31	darkslategray
11	darkturquoise	32	dimgray
12	mediumturquoise	33	lightgray
13	cadetblue	34	gray
14	cornflowerblue	35	cadetblue1
15	darkslateblue	36	cadetblue2
16	lightblue	37	cadetblue3
17	lightsteelblue	38	cadetblue4
18	mediumblue	39	purple
19	mediumslateblue	40	gray59
20	midnightblue	41	gray91
42	navyblue	65	aliceblue
43	skyblue	66	bisque
44	slateblue	67	bisque2
45	steelblue	68	bisque3
46	coral	69	bisque4
47	firebrick	70	chartreuse1

48	mediumgoldenrod	71	chartreuse2
49	darkgreen	72	chartreuse3
50	darkolivegreen	73	chartreuse4
51	forestgreen	74	dodgerblue1
52	limegreen	75	dodgerblue2
53	mediumforestgreen	76	dodgerblue3
54	mediumseagreen	77	dodgerblue4
55	mediumspringgreen	78	firebrick3
56	palegreen	79	firebrick4
57	greenyellow	80	green2
58	seagreen	81	honeydew1
59	springgreen	82	honeydew2
60	yellowgreen	83	honeydew3
61	maroon	84	honeydew4
62	orange	85	hotpink
63	orchid	86	lightseagreen
64	darkorchid	87	mistyrose
88	mediumorchid	97	peachpuff
89	pink	98	lightsteelblue1
90	plum	99	lightsteelblue2
91	indianred	100	lightsteelblue3
92	mediumvioletred	101	lightsteelblue4
93	orangered	102	peru
94	violetred	103	powderblue
95	violet		
96	blueviolet		

APPENDIX B

X Bitmapped and Scalable Fonts

Sammi supports scalable (vector) fonts that can be selected either from the same option menus as the X bitmapped fonts, or from the *Current Font Selection* panel. These fonts allow you to resize and to rotate text in the same way as other static objects.

Only fixed-pitch scalable fonts, that is, fonts that have `fixed-scale` in their title, can be used in the DFDs that allow scalable fonts. These DFDs are:

Text	*Integer*	*Real*	*Formatted Numeric*
Bar	*Meter/Gauge*	*Tabular*	
Equation	*Custom Time*	*Alarm*	*Text Table*

All other DFDs can use only standard X bitmapped fonts, that is, fonts without `scale`, or `fixed-scale` in their title, and, if you try to use a scalable font in these DFDs, you will get an error message.

Be aware of the following issues concerning scalable (vector) fonts:

- Even though the scalable fonts can be scaled to any size using the *Resize Tool*, the font will have an initial point size when you select it. (The initial point size is shown within parentheses as part of the font name.)

- Some fonts include "simplex", "duplex", "triplex", and "complex" in their names. This tells you how many parallel strokes are required to create the font. "Simplex" takes a single stroke, "duplex" takes two strokes, "triplex" takes three strokes, and "complex" takes more than three strokes.

- Any static text object created under *Sammi* Version 2.2 or later can change between any standard fixed font and any scalable font; however, a static text object created in earlier versions of *Sammi* cannot be changed to a scalable font. Any attempt will result in an error message.

- The standard fixed fonts provided with *Sammi* are shown on the next page. Fonts are used for any text display in *Sammi* and may be set individually for a wide range of text displays.

fixed

6 X 12 fixed

8 X 13 fixed

8 X 13 fixed bold

9 X 15 fixed

(ΑΒΧΔΕΦΓΗΙ) greek medium 12 pt.

(ϑΚΛΜΝΟΠ) greek medium 14 pt.

(ΘΣΤΥςΩ) greek medium18pt.

courier medium 8 pt.

courier medium10 pt.

courier medium 12 pt.

courier medium 14 pt.

courier medium 18pt.

courier medium 24pt.

courier bold 8 pt.

courier bold 10 pt.

courier bold 12 pt.

courier bold 14 pt.

courier bold 18 pt.

courier bold 24 pt.

helvetica bold 8 pt.

helvetica bold 10 p t.

helvetica bold 12 pt.

helvetica bold 14pt.

helvetica bold 18 pt.

helvetica bold   24pt.

αβχδεϕγηιφκλμνοπθρστυϖωξψζ0123456789

abcdefghijklmnopqrstuvwxyz0123456789

abcdefghijklmnopqrstuvwxyz0123456789

abcdefghijklmnopqrstuvwxyz0123456789

abcdefghijklmnopqrstuvwxyz0123456789

abcdefghijklmnopqrstuvwxyz0123456789

abcdefghijklmnopqrstuvwxyz0123456789

abcdefghijklmnopqrstuvwxyz0123456789

abcdefghijklmnopqrstuvwxyz0123456789

abcdefghijklmnopqrstuvwxyz0123456789

abcdefghijklmnopqrstuvwxyz0123456789

abcdefghijklmnopqrstuvwxyz0123456789

abcdefghijklmnopqrstuvwxyz0123456789

abcdefghijklmnopqrstuvwxyz0123456789

abcdefghijklmnopqrstuvwxyz0123456789

abcdefghijklmnopqrstuvwxyz0123456789

abcdefghijklmnopqrstuvwxyz0123456789

abcdefghijklmnopqrstuvwxyz0123456789

abcdefghijklmnopqrstuvwxyz0123456789

abcdefghijklmnopqrstuvwxyz0123456789

abcdefghijklmnopqrstuvwxyz0123456789

abcdefghijklmnopqrstuvwxyz012345678

abcdefghijklmnopqrstuvwxyz0123456789

This appendix contains an example of a Standard Command file, `test_list.cmd`. This file holds the information on Standard Select Lists and, when the Runtime Environment is started, is read into cache memory that has been allocated by `s2_event`.

The End Items, within current CCU/CDU, of type FWDU_LIST_TEXT are extracted from the MDB at start-up, so the SAMMI runtime system are aware of the existents of .cmd files.

The included .cmd files are located in $FWDU_HOME/lib.

NOTE: When entering text in the file, DO NOT place a blank space in the first column; you must enter a character.

Formats

This file contains tables for the Standard Select List DFDs and Standard Menu DFDs. Each table consists of one header record followed by one or more item entries. Each item entry consist of three records.

NOTE: All entries except the keyword `LIST_TABLE` (or `MENU_TABLE`) are enclosed in double quotes.

Header record:

```
LIST_TABLE (or MENU_TABLE)
```

There can only be one header record (`LIST_TABLE or MENU_TABLE) per FWDU_LIST_TEXT End Item.`

The formats for the item entry contain the same item/command information as the Menu DFDs. The formats for the item entry records are:

First record:

```
<cascade level> "<item string>"
```

`<cascade level>`	FOR MENU TABLE ONLY. An integer value representing the “Cascade Level” of a menu item. This required value should start at 1, increasing (and subsequently decreasing) for each level of a cascade menu (a one level menu is valid). An empty entry on the same level is used as a separator (blank line) between items on the same level.
`<item string>`	The text as it appears in the format in the Standard Select List DFD (or Standard Menu). The maximum text length is 40 characters.

Second record:

```
"<logical srvr>" "<format name>" "<dfd name>" "Y"|"N"
```

`<logical srvr>`	The name of the server to which the command/text string is sent. For predefined commands use "FWDU_SERVER" and for Sammi commands use "$local-cmd".
`<format name>`	If the command/text string is to be sent to a particular format, enter the name of that format. The maximum length is 32 characters. Do not use this for onboard pre-defined commands.
`<dfd name>`	If the command/text string is to be sent to a particular DFD, enter the name of that DFD. The maximum length is 12 characters. Do not use this for onboard pre-defined commands.
`Y | N`	If the command/text string is an executable *Sammi* command, enter “Y”. Otherwise, enter “N”. For on-board pre-defined commands only use "N".

Third record:

```
"<command>" or "<text string>"
```

`<command>`	The command string for a *Sammi* command that will be executed when the item is chosen from the select list (or menu).
`<text string>`	The text string is to be sent to the logical server or to the selected DFD when this item is chosen from the Select List. The maximum length of this string is 80 characters.

If you define the <`command`> or the <`text string`> as `"@item"`, the string defined for the <`list item string`> from the first item record will be substituted for `"@item"` before the command or string is sent to its target.

The next page gives the actual layout of a FWDU_LIST_TEXT.

Examples

The following are examples of FWDU_LIST_TEXT's. Note that all End Item pathnames are in the example are written as \MDB\PATH\... These pathnames should be valid paths in the MDB and should be of type FWDU_SYNOPTIC_DISPLAY. The pathname is checked when the FWDU_LIST_TEXT is saved.

```
Test table to add formats:

LIST_TABLE
"sample_eqn"                    #Select list item text record
   "$local-cmd" "" ""  "Y"      #Item target record
   "add-win \MDB\PATH\sample_eqn"#End Item path in the MDB
"sample_font"                   #Select list command record
   "$local-cmd" "" ""  "Y"      #Item target record
   "add-win \MDB\PATH\sample_font"#End Item path in the MDB
"sample_color"                  #Select list command record
   "$local-cmd" "" ""  "Y"      #Item target record
   "add-win \MDB\PATH\sample_color"#End Item path in the MDB

Test table to delete formats:

LIST_TABLE
"sample_eqn"                    #Select list item text record
   "$local-cmd" "" ""  "Y"      #Item target record
   "del-win \MDB\PATH\sample_eqn"#End Item path in the MDB
"sample_font"                   #Select list command record
   "$local-cmd" "" ""  "Y"      #Item target record
   "del-win \MDB\PATH\sample_font"#End Item path in the MDB
"sample_color"                  #Select list command record
   "$local-cmd" "" ""  "Y"      #Item target record
   "del-win \MDB\PATH\sample_color"#End Item path in the MDB

Test table for a select list used as an “On/Off” option list

LIST_TABLE

"On"                  #First item entry record
   """ ""  " ""Y"     #Second item entry record
   "@item"            #Use list item string
"Off"                 #First item entry record
   "" """"  "Y"       #Second item entry record
   "@item"            #Use list item string
```

A command file may contain one menu (or selection list)

Test table for menu:

```
MENU_TABLE
1 "qa_integer1"    First item entry record
   "$local-cmd" "" ""  "Y"      #Second item entry record
   "del-win \MDB\PATH\qa_int"   #Third item entry record
1 "qa_real1"                    #First item entry record
   "$local-cmd" "" ""  "Y"      #Second item entry record
  "del-win \MDB\PATH\qa_real1"  #Third item entry record
1 ”qa_meter1"                   #First item entry record
   "$local-cmd" "" ""  "Y"      #Second item entry record
   "del-win \MDB\PATH\qa_meter" #Third item entry record
```

Menu table with Onboard Pre-defined commands.

```
MENU_TABLE
1 "Help"
"FWDU_SERVER" "" "" "N"         # Onboard
"HELP"

1 "Mark Display"
"FWDU_SERVER" "" "" "N"         # Onboard
"MARK"

1 "Open Marked Window List"
"FWDU_SERVER" "" "" "N"         # Onboard
"MUR"
```

Format Editor option menu file

The following file is used to create the mouse OPTION button pop-up option list for the *Drawing Area* of the Format Editor. This file can be customized to include/exclude menu selections for the *Drawing Area.* Note that this is a Standard Sammi file and that it will not work in the FWDU without modifications.

The name of the file is `fe_std_menu.cmd`; it is located in a `$Sammi/data` directory (as specified by `SAM2_DATAFILE`, either in your environment or in the `start_sammi` script).

```
MENU_TABLE "fe_std_menu" #Menu table name
1  "Undo"                #Undo Command
   "$local-cmd" "" ""  "Y"#
   "fe-objects undo"
1  "Redisplay"           #Redisplay command
   "$local-cmd" "" ""  "Y"
   "fe-objects redisplay"
1  "Remove All"          #Remove All Command
   "$local-cmd" "" ""  "Y"#
   "fe-objects delete all; fe-objects redisplay"
1  "Zoom In"             #Zoom in command
   "$local-cmd" "" ""  "Y"
   "zoom $fb-bkgd -z 200"
1  "Zoom Out"            #Zoom out command
   "$local-cmd" "" ""  "Y"
   "zoom $fb-bkgd -z 50"
1  "Zoom Box"            #Zoom box
   "$local-cmd" "" ""  "Y"
   "zoom $fb-bkgd -b"
1  "Full View"           #Full View
   "$local-cmd" "" ""  "Y"
   "zoom $fb-bkgd -a -z 100 -x 0 -y 0"
1  "Reset Initial"       #Reset
   "$local-cmd" "" ""  "Y"
   "zoom $fb-bkgd -r"
1  "Reset Maximum"       #Reset Maximum
   "$local-cmd" "" ""  "Y"
   "zoom $fb-bkgd -r -m"
1  "Pan To"              #Pan
   "$local-cmd" "" ""  "Y"
   "pan $fb-bkgd -p"
```

Runtime Environment option menu file

The following file is used to create the mouse OPTION button pop-up option list for the Runtime Environment. This file can be customized to include/exclude menu selections for the Runtime Environment. Note that this is a Standard Sammi file and that it will not work in the FWDU without modifications.

The name of the file is `std_menu.cmd;`it is located in the `$SAMMI/data` directory.

```
MENU_TABLE "standard_menu"     #Menu table name
1  "Modify Layers"             #Modify Layers Command
    "" "layer" "format_name" "Y"
   "$local-win"
1  "Zoom In"                   #Zoom in command
   "$local-cmd" "" ""  "Y"
   "zoom -c -z 200"
1  "Zoom Out"                  #Zoom out command
   "$local-cmd" "" ""  "Y"
   "zoom -c -z 50"
1  "Zoom Box"                  #Zoom box
   "$local-cmd" "" ""  "Y"
   "zoom -b"
1  "Full View"                 #Full View
   "$local-cmd" "" ""  "Y"
   "zoom -c -a -z 100 -x 0 -y 0"
1  "Reset Scale"               #Reset Scale
   "$local-cmd" "" ""  "Y"
   "zoom -c -r"
1  "Pan To"                    #Pan
   "$local-cmd" "" ""  "Y"
   "pan -p"
```

Index comparison method

```
RTDA_TYPE index-comparison
f000000  f00   f000  f00000   f0    f0000    f
# Each hexadecimal represents one of the possible attributes.
# The number at the top of each column of fields is not part of the
file but is used as a #reference in the discussion, at the bottom
of the actual table, of the function of each field.
#1    2      3      4     5  6   7       8     9    10
0     ,RED  ,BLUE ,     ,A1,  ,     LEX,  ,     ,     ,
1     ,BLUE ,GREEN,     ,B2,  ,     LEX,  ,     ,     ,
2     ,GREEN,YELLOW,    ,C3,  ,     LEX,  ,     ,     ,
3     ,YELLOW,MAGENTA,  ,D4,  ,     LEX,  ,     ,     ,
4     ,BLACK,     ,     ,E5,  ,     LEX,  ,     ,     ,
5     ,WHITE,     ,     ,F6,  ,     LEX,  ,     ,     ,
6     ,RED  ,WHITE,     ,\s7, ,     LEX,  ,     ,     ,
.
.
.
10    ,WHITE,BLACK,     ,R\0  ,     LEX,  ,     ,     ,
#KEY:
# Col.1.    Record (row) number.
# Col.2.    Foreground color for DFD and both characters fg_color
            and char_fg_color use field 2, although each has its own
            mask).
# Col.3.    Background color for DFD and both characters bg_color
            and char_bg_color use field 3, although each has its own
            mask).
# Col.4.    Blink/noblink for DFD. Although a comma for this field
            must be included in the rtda.dat file, it is ignored by
            the index-comparison method. Instead, the incoming
            value is ANDed with the mask; if the resulting value
            is 0, blinking is enabled; if the value is not 0,
            blinking is not enabled.
#Col. 5.    Character 1 and character 2 (char_1 and char_2; note
            that while this entry occurs as a single field in the
            table, each has a separate entry in the mask
            definition). Null and blank entries in either of the
            positions are represented by \0 and \s respectively. An
            explanation of the behavior of each of these values can
            be found at the end of this discussion of the index-
            comparison method.
#Col. 6.    An obsolete entry; always leave blank, but include
            comma as shown.
#Col. 7.    Used for MTC or LEX method; leave blank for index-
            comparison method.
#Col. 8.    Used for MTC; leave blank for index-comparison (and LEX)
            methods.
#Col. 9.    Used for MTC; leave blank for index-comparison (and LEX)
            methods.
#Col. 10.   Used for MTC; leave blank for index-comparison (and LEX)
            methods.
```

APPENDIX D-384 Sample Runtime Annotations Table

Each mask hex value tells which bits in the quality word are to be ANDed. Each 0 represents 0000 and the f represents 1111. Thus the mask value in the sample above for foreground color is found in bits 28-31 of the quality word, with bits 0-27 filled with zeros:

```
1111 |0000 |0000 |0000 |0000 |0000 |0000 |0000
```

The last four bits of the quality word are ANDed with the last four bits of the mask. If the quality word is 00100010110010011100101100010110, the last four bits, here with a value of 0010, are ANDed with 1111:

```
1111
0010

0010
```

0010 converts to a decimal 2; thus the foreground color is taken from record 2 (the third record) in rtda.dat file and has a value of (is displayed) as GREEN.

The mask value for background color is found in bits 8-11, with bits with bits 0-7 holding zeros:

```
1111 |0000 |0000
```

Bits 8-11 of the mask are ANDed to bits 8-11 of the quality word

00100010110010011100101000010110:

```
1111
1010

1010
```

1010 converts to a decimal 10, so the background color is determined from record 10 (eleventh record) of the rtda.dat file and has a value of BLACK.

This approach to runtime annotations allows an almost limitless number of records; when the file is created, it must have as many records as the highest possible value of the quality word.

Substitutions for null (\0) and blank (\s) entries are given below:

- If fg_color or char_fg_color = 0 in the mask or is a blank in that entry in the table, the DFD foreground color is used.
- If bg_color or char_bg_color = 0 in the mask or is a blank (\s) in that entry in the table, the DFD background color is used.
- If both char1 and char2 = \0, the bounding box drawn around enterable DFDs at runtime will not contain appended characters.
- If char1 = \0 or \s and char2 is not \0, a two-character bounding box is drawn in runtime, with char1 displayed as a blank space.
- If neither char1 or char2 = \0, a two-character bounding box is drawn in runtime.

LEX method

```
#
# <mask>, [fg], [bg], [blink], [ac], [ac_color], <function>, [ shift, opcode, value ]
# where:
#       mask     = hex bitmask (0x00000001) or predefined bitmask RTDA_U1(rtda.h)
#       fg       = foreground color, blank = use current
#       bg       = background color, blank = use current
#       blink    = blink, blank = no blink
#       ac       = appended characters, up to two
#       ac_color = append character color, blank = use current
#       function = LEX (logical true)
#                  MTC (Multibit Translate and Compare)
#       shift    = shift value for MTC types
#       opcode   = comparison operation (EQ, NE, GT, GE, LT, LE) for MTC types
#       value    = value to compare against for MTC types
#
# The table is in decreasing order of priority
#
#
536870912 , WHITE , BLUE  ,  ,  D,     , LEX       #Deactivated (off scan)
2147483648, YELLOW , RED   ,    ,  N,       , LEX       #non update (communication error)
1073741824, BLUE   , WHITE , ,  I,    , LEX           #Inhibited (operator invalidated)
# Use different color for unack until blink works on sun
#1        , RED     , BLACK , Y,   ,     , LEX        #Unacknowledged alarm
1         , RED     , YELLOW, Y,   ,     , LEX        #Unacknowledged alarm
32        , MAGENTA , BLACK ,  ,  C,     , LEX        #Commanded device
64        , BLUE    , RED   ,  ,  T,     , LEX        #Transducer error
256       , RED     , BLACK ,  , HH,     , LEX        #High High
128       , RED     , BLACK ,  , LL,     , LEX        #Low Low
8         , RED     , BLACK ,  ,  R,     , LEX        #rate of change
4         , RED     , BLACK ,  ,  H,     , LEX        #High
16        , RED     , BLACK ,  , AL,     , LEX        #Alarm state
```

APPENDIX D-386 Sample Runtime Annotations Table

Pixel Measurements

Sammi can be used on a wide variety of workstations and each workstation may have a different monitor resolution. For this reason, measurements of length or size must often be expressed in pixels, instead of inches or centimeters.

The actual distance described by a certain number of pixels depends on the size and resolution of the workstation monitor. For example, if the screen resolution is 85 dots per inch, then 85 pixels equals one inch or 2.54 centimeters.

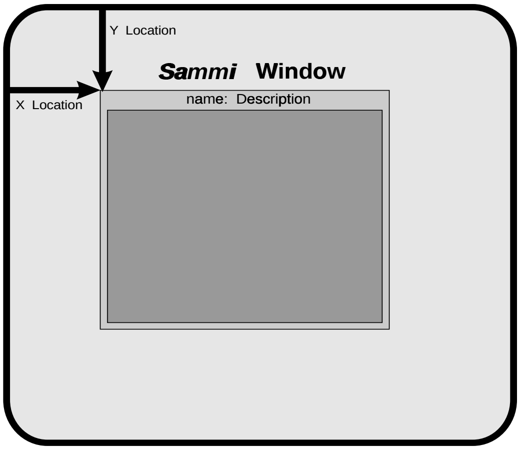
How to determine pixel resolution on the SUN

To determine the resolution for a particular display in pixels per inch (also known as dots per inch), log on to that workstation and enter the following command in any shelltool window:

```
xdpyinfo
```

When you enter this command, a considerable amount of data scrolls by. The information you need is listed under “screen resolution.” If the command `xdpyinfo` is not found, contact your System Administrator for help.

How to use pixel resolution



X/Y Location of a Format

One typical use of pixel resolution is to specify the *X/Y Location* of a format. Loosely speaking, *X/Y Location* indicates how far the top left corner of the *Sammi* window will be located from the top left corner of the monitor screen when the window appears in *Sammi*.

More precisely:

- **X Location** is the distance in pixels from the left edge of the visible screen to the left edge of the *Sammi* window.
- **Y Location** is the distance in pixels from the top edge of the visible screen to the top edge of the *Sammi* window. *X/Y Location* is also used to indicate the position of a dynamic field inside a format. *X/Y Location* of a dynamic field is the distance from the top/left edge of the format.

For example, on an 85 dot-per-inch monitor, if the desired location of the window is two inches from the left side of the screen and one inch from the top, the *X Location* would be 170 pixels and the *Y Location* would be 85 pixels. However, if you wanted the window to fit snugly inside the top left corner of the screen, both the X and Y Location would be 0 pixels.

Conversion Factors

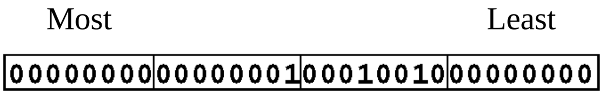
You can convert the values of certain dynamic fields (such as *Real*) that the Runtime Environment displays by entering the *Conversion Factor Codes* from this table into the *Conversion* field of the relevant dynamic fields.

Conversion Type	Conversion Factor Code	Conversion Formula
No Conversion	0	X = 1.0 * Y
PSFA to PSIG	1	X = (Y - 14.696)/144.0
Hundred to unit	2	X = Y *100.0
Thousand to unit	3	X = Y *1000.0
Million to unit	4	X = Y *1000000
Unit to hundred	5	X = Y/100.0
Unit to thousand	6	X = Y/1000.0
Unit to million	7	X = Y/1000000.0
Second to minute	8	X = Y/60.0
Second to hour	9	X = Y/3600.0
Second to day	10	X = Y/86400.0
Minute to second	11	X = Y * 60.0
Inch to foot	12	X = Y/12.0
Ounce to pound	13	X = Y/16.0
Pound to ton	14	X = Y/2000.0
Liter to gallon	15	X = Y/3.7854
Cubic inch to gallon	16	X = Y/231.0
Gallon to barrel	17	X = Y/42.0
Cubic inch to cubic foot	18	X = Y/1728.0
Centigrade to Fahrenheit	19	X = Y * 9.0/5.0 + 32
Fahrenheit to Centigrade	20	X = (Y - 32.0)/1.8
Inch to centimeter	21	X = Y * 2.54
Meter to foot	22	X = Y * 3.281
Mile to kilometer	23	X = Y * 1.6093
Kilogram to pound	24	X = Y * 2.2046
Pound to kilogram	25	Y = Y * 0.4536
Degree to radian	26	X = Y * 3.14159/180.0

For example, if you enter 8 in the *Conversion* field, the incoming data value is divided by 60 (seconds to minutes) before being displayed, and any *Sammi* user entry is multiplied by 60 (minutes to seconds) before being transmitted to the data server.

Several of the display types discussed in ***Chapter 7*** of this guide allow you to selectively shift and mask the incoming data value. This means, instead of using the raw value exactly as it is received from the data server, you can mask out selected “bits” and use what is left. Typically, an incoming value consists of 32 bits, as shown below:

The bits along this data value range from “most significant” on one end to “least significant” on the other end. You can set *Sammi* to automatically edit out certain bits by using the shifting and masking functions described below.

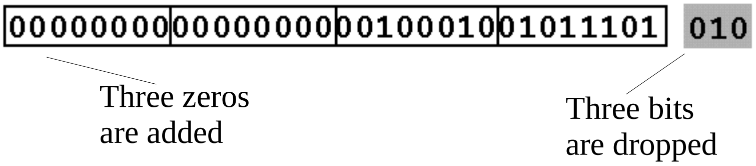


32-bit data value (binary format)

Shifting

The Shift Right function causes the entire data value to be shifted by a certain number of bits. For example, if you entered a Shift Right value of 3, all 32 bits in the data value would be shifted toward the least significant end by three bits. This would cause three bits to be dropped from one end and three zeros (0) to be added to the other end, as shown below:

SHIFT RIGHT = 3



Masking

After any desired shifting has been accomplished, a mask value may also be specified to selectively mask off some of the remaining bits. The mask value is entered as a hexadecimal number, but is applied to the data value in binary format (since all machine numbers are binary). Thus, all zeros (0) in the mask will zero out the corresponding data bits and all ones (1) in the mask will leave the corresponding data bits unchanged. For example:

```
00000000000000000000000000011011     Mask (Hex) = 1B

00000000|00000000|01000100|01011101  Data

00000000000000000000000000011001     Result
```

In the example above, a hexadecimal mask value of 1B is equivalent to 11011 binary. This binary mask, when given leading zeros and laid over the 32-bit data value, zeros out all corresponding bits in the data value except where a 1 appears in the mask (shading indicates where zeroing occurs). The result of the masking process in the illustration above is a net data value of 11001 binary or 25 decimal.

NOTE: Remember that if a Shift Right value was specified, masking is applied *after* shifting. A mask value of 0 shuts off both the shifting and masking functions simultaneously. To shift without masking, you must use a mask value of FFFFFFFF.

APPENDIX H Alarm Formats and Colors

Not used in the FWDU.

APPENDIX H-394 Alarm Formats and Colors

The equation string of an equation DFD is specified using the Eqn language. *Eqn* is an expression language, much like C. Although there are several control-flow statements, most statements such as assignments, are expressions whose value is disregarded. For example, the assignment operator “=” assigns the value of its right operand to its left operand, and yields the value, so multiple assignments work. The expression grammar is:

```
expr:      field-value
           number
           variable
           (expr)
           unop expr
           expr bwop expr
           built-in function (arguments)
           user-defined function
```

A field-value is the value of another numeric DFD within the window. It is referenced by `@<dfd-name>`. Its value is expanded in place.

Numbers are floating point. The input format is that recognized by the standard C function scanf: i.e. digits, decimal point, digits, e, signed exponent. At least one digit or a decimal point must be present; the other components are optional.

Variable names are formed from a letter followed by a string of letters and numbers, binop refers to binary operators such as addition or logical comparison; unop refers to the two negation operators, '!' (logical negation, 'not') and '-' (arithmetic negation, sign change). Operators are shown on the next page.

Operators, in decreasing order of precedence

`^`	exponentiation (FORTRAN**), right associative
`!`	(unary) logical and arithmetic negation
`* /`	multiplication, division
`+ –`	addition, subtraction
`> >=`	greater, greater or equal
`< <=`	less, less or equal
`== |=`	equal, not equal (same precedence)
`&&`	logical AND (both operands always evaluated)
`||`	logical OR (both operands always evaluated)
`=`	assignment, right associative

Built-in functions which take a single argument are described below.

Built-in functions

`abs(x)`	|x|, absolute value of x
`atan(x)`	arc(x), arc tangent of x
`cos(x)`	cos(x), cosine of x
`exp(x)`	e^x, exponential of x
`int(x)`	integer para of x, truncated towards zero
`log(x)`	log(x), logarithm base e of x
`log10(x)`	$\log_1$0(x), logarithm base 10 of x
`sin(x)`	sin(x), sine of x
`sqrt(x)`	$\sqrt{x}$, square root of x

Logical expressions have a value 1.0 (true) and 0.0 (false). As in C, any non-zero value is taken to be true. As is always the case with floating point numbers, equality comparisons are inherently suspect. *Eqn* also has a few built-in constants, shown below:

Built-in constants

`DEG`	180π degrees per radian
`E`	*e*, base of natural logarithms
`GAMMA`	γ, Euler-Mascheroni constant
`PHI`	(√5+1)/2, the golden ratio
`PI`	π, ratio of circumference to diameter

Statements and control flow

Eqn statements have the following grammar:

```
stmtlist:(nothing)
stmt; stmtlist
stmt: expr
variable = expr
while (expr) stmt
if (expr) stmt
if (expr) stmt else stmt
{stmtlist}
print expr-list
```

The syntax and semantics of *eqn* control flow facilities are basically the same as in C. The *while* and *if* statements are just as in C, except there are no *break* or *continue* statements.

Input and output (@ and print)

There is no input primitive, per se. Input is accomplished by referencing the numeric value of other dynamic fields of the same window. Consider these dynamic fields as instantiated global constants. These values may not be changed.

Output is generated with the `print` statement. The arguments to print are a comma-separated list of expressions and strings in double quotes, as in C.

```
print “value is”, x
```

The at (@) operator retrieves a value from a named dynamic field. The syntax is:

```
@<dfd-name>
```

where:

`dfd-name`	Name of a dynamic field. `dfd-name` may be any valid DFD name (that is, contains only A...Z, a...z, 0...9,“_” (underscore).

For example:

```
print @number_dfd1 + @number_dfd2
```

This command retrieves, and adds the values stored in `number_dfd1` and `number_dfd2`, then displays the sum in the equation dynamic field.

User-defined functions

You can define your own functions in the equation. A function definition is specified and the function is used later in the expression. The function definition specification is:

```
func <function name> () {statement list}
```

For example, the following equation string prints the sum of two times the values of two DFDs.

```
func twox() {return 2 * $1 + 2 * $2;} print twox
(@field1,@field2)
```

```
#define pump_width 32
#define pump_height 32
static char pump_bits[] = {
   0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
   0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xfc, 0xff, 0x0f,
   0x00, 0x83, 0x03, 0x08, 0xc0, 0x00, 0x06, 0x78, 0x40, 0x00, 0x0c, 0x78,
   0x20, 0x00, 0x18, 0x68, 0x20, 0x00, 0xf8, 0x6f, 0x10, 0x00, 0x10, 0x60,
   0x10, 0x00, 0x10, 0x60, 0x10, 0x00, 0x10, 0x60, 0x10, 0x00, 0x10, 0x60,
   0x10, 0x00, 0x10, 0x60, 0x3f, 0x00, 0x08, 0xe0, 0x3f, 0x00, 0x08, 0xe0,
   0x40, 0x00, 0x04, 0x00, 0xc0, 0x00, 0x06, 0x00, 0x00, 0x83, 0x01, 0x00,
   0x00, 0xff, 0x00, 0x00, 0x80, 0x81, 0x01, 0x00, 0xc0, 0x00, 0x03, 0x00,
   0x60, 0x00, 0x06, 0x00, 0x30, 0x00, 0x0c, 0x00, 0xf8, 0xff, 0x1f, 0x00,
   0xf8, 0xff, 0x1f, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
   0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00};
```

APPENDIX J-400 Sample Bitmap Symbol File

APPENDIX K Sample Dynamic Object Table

```
#
# test file for dynamic objects
# table lookup
# The file format is an ascii file with a header line indicating
# the type of table:
#     (table_lookup | value_substitution )
#     where:
#       table_lookup = lookup the data value in the table to find the
#                      corresponding attributes.
#       value_substitution = use the data value as the attribute value
#
# each following line consists of 15 entries in the following sequence:
#  (value) (fg clr) (bg clr) (blink) (fill style) (fill stipple index)\
#  (line style) (line dash index) (thickness) (x scale) (y scale)\
#  (x location) (y location) (rotate) (gravity) (fill level)
#   where:
#    value   = value to compare against data value (float)
#    fg clr  = foreground color (ascii | d[efault] | v[0->n])
#    bg clr  = background color (ascii | d[efault] | v[0->n])
#    blink   = blink flag (b[link] | n[oblink] | d[efault] | v[0->n])
#
#              Unless blink is specified, fg_clr and bg_clr can be
#              standard color.
#
#              If blink is specified, fg_clr and bg_clr can only be black,
#              white, red, green, blue, yellow, cyan, or magenta.
#
#    fill style = Area fill style (0 | 2 | 3 | d[efault] | v[0->n])
#           0=fill solid, 2=fill stippled, 3=fill opaque stippled,
#           1=no fill
#    fill stipple index = Area fill stipple index (0->max stipple |
#                  d[efault] | v[0->n])
#    line style = Line drawing style (0 | 1 | 2 | d[efault] | v[0->n])
#            0=solid, 1=dash, 2=double dash
#    line dash index = Line drawing dash index (0->max dash index |
#                 d[efault] | v[0->n])
#    thickness = Line thickness (0->max thickness| d[efault]|v[0->n])
#      x scale = x scaling factor in percent(int | d[efault] | v[0->n])
#      y scale = y scaling factor in percent(int | d[efault] | v[0->n])
#      x location = x pixel location factor (int | d[efault] | v[0->n])
#      y location = y pixel location factor (int | d[efault] | v[0->n])
#      rotate = rotation angle in degrees*64 (int| d[efault] | v[0->n])
#      gravity  = scale and rotate gravity ( 0->9| d[efault] | v[0->n])
#           0=default, 1=NorthWest, 2=North, 3=NorthEast,
#           4=West, 5=Center, 6=East, 7=SouthWest, 8=South, 9=SouthEast
#    fill level = percentage of how much to fill object for a given value range.
```

APPENDIX K-402 Sample Dynamic Object Table

```
table_lookup
1.0    white   black   blnk         0 0   0 0   10  d   d    d d     d   d  d
2.0    red     blue    noblnk       0 0   0 0   1   d   d    d d     d   d  d
3.0    green   red     blnk         0 0   1 1   10  d   d    d d     d   d  d
4.0    blue    green   noblnk       0 0   1 2   1   d   6    d d     d   d  d
5.0    cyan    green   blnk         0 0   1 3   10  d   d    d d     d   d  d
6.0    magenta black   noblnk       2 1   1 2   3   d   d    d d     d   d  d
7.0    yellow  d       blink        2 2   1 2   3   d   d    d d     d   d  d
8.0    aquaramarine d  blink        2 3   1 2   3   d   d    d d     d   d  d
9.0    MediumAquamarine d noblink   0 0   2 1   10  d   d    d d     d   d  d
10.0   turquoise d     blink        0 0   2 2   10  d   d    d d     d   d  d


#     test file for dynamic objects
#     value substituion - fill style
value_substitution
4.0    green d   noblnk    v0 2   d d   d  d d   d d   d   d  0
5.0    red   d   noblnk    0  2   d d   d  d d   d d   d   d  20
6.0    red   d   noblnk    1  2   d d   d  d d   d d   d   d  40
7.0    red   d   noblnk    2  2   d d   d  d d   d d   d   d  60
8.0    red   d   noblnk    3  2   d d   d  d d   d d   d   d  80
9.0    red   d   noblnk    0  2   d d   d  d d   d d   d   d  100


#
#     test file for dynamic objects
#     value substitution - gravity
value-substitution
0.0    d    d   noblnk   d d   d d   d   d d   d d    240 v0  d
1.0    d    d   noblnk   d d   d d   d   d d   d d    480 5   d
2.0    d    d   noblnk   d d   d d   d   d d   d d    960 0   d
4.0    d    d   noblnk   d d   d d   d   d d   d d    960 9   d
6.0    d    d   noblnk   d d   d d   d   d d   d d    960 1   d
7.0    d    d   noblnk   d d   d d   d   d d   d d    v0  0   d
```

APPENDIX L Sample Symbol/Text Tables L-403

This appendix contains samples of both a symbol lookup table and a text lookup table. The End Items, within current CCU/CDU, of type FWDU_SYMBOL_TABLE_TEXT are extracted from the MDB at startup, so the SAMMI runtime system are aware of the existents of .safs files.

The included .safs files are located in $FWDU_HOME/lib.

Symbol table – value lookup file example

```
#
#  valuesym.safs - example definition file for value lookup symbol table
#
#  header record (MUST BE BEFORE symbol entry records):

SYMBOL value-lookup

#  symbol entry records:
#
#  entry format is:
#  value  sym_name  fg_color  bg_color  <optional> blink
#
#  value is the minimum value in a range of values.
#      Data values are compared with symbol values. The symbol is
#      selected using the following comparison:
#      If value of record i <= data value < value of record i+1,
#      select symbol from record i.
#      (see below).
#  sym_name is the name of the bitmap file for the symbol. MUST be
#      quoted.
#  fg_color is the foreground color.
#  bg_color is the background color.
#  blink is an optional keyword. If present, the symbol will blink
#     when it is displayed.
#
#  Unless blink is specified, fg_color and bg_color can be any
#  standard color.
#
#  If blink is specified, fg_color and bg_color can only be black,
#  white, red, green, blue, yellow, cyan, or magenta.
#
#  Entry records must be arranged so that the values associated with
#  the symbols INCREASE from the first record to the last record.

 0.0 "valcls"    red        white
 5.0 "valtran3"  magenta    white
10.0 "valtran2"  magenta    white
15.0 "valtran1"  magenta    white
20.0 "valopn"    blue       white

#  Here is how the value lookup works for this example file:
#
#  incoming value  selected symbol       reason
#
#      0.5          valcls                0.0 <=  0.5   < 5.0
#     14.995        valtran2             10.0 <= 14.995 < 15.0
#     20.0          valopn               20.0 <= 20.0   < infinity
#   -109.2          valcls          -infinity < -109.2  < 0.0
```

Symbol table – index lookup file example

```
#
#  indexsym.safs - example definition file for index lookup symbol table
#

#  header record (MUST BE BEFORE symbol entry records):

SYMBOL index-lookup

#  symbol entry records:
#
#  entry format is:
#  sym_name  fg_color  bg_color  <optional> blink
#
#  sym_name is the name of the bitmap file for the symbol. MUST be
#      quoted.
#  fg_color is the foreground color.
#  bg_color is the background color.
#  blink is an optional keyword. If present, the symbol will blink
#     when it is displayed.
#
#  Unless blink is specified, fg_color and bg_color can be any
#  standard color.
#
#  If blink is specified, fg_color and bg_color can only be black,
#  white, red, green, blue, yellow, cyan, or magenta.
#
#  Records are 1-5. Symbol table indexes corresponding to the
#  symbol entry records are: index 0 = record 1, index 1 = record 2,
#  index 2 = record 3, index 3 = record 4, and index 4 = record 5.
#
#  Data values are converted to long integers, shifted and masked, and
#  the resulting number is used as the index into the symbol table.
#  If the resulting index is 0, “valcls” is selected, and if it is
#  4, “valopn” is selected. If the index is out of range, an
#  “error symbol” is selected.
#

"valcls"      red        white
"valtran3"    magenta    white
"valtran2"    magenta    white
"valtran1"    magenta    white
"valopn"      blue       white
```

Text table — value lookup file example

```
#
#  valuetxt.safs - example definition file for value lookup text table
#
#  header record (MUST BE BEFORE symbol entry records):

TEXT value-lookup

#  text entry records:
#
#  entry format is:
#  value  txt_string  fg_color  bg_color  <optional> blink
#
#  value is the minimum value in a range of values.
#      Data values are compared with text values.  The text is
#      selected using the following comparison:
#      If value of record i <= data value < value of record i+1,
#      select text string from record i.
#      (see below).
#  txt_string is the actual string to be displayed.  MUST be
#      quoted.
#  fg_color is the foreground color.
#  bg_color is the background color.
#  blink is an optional keyword.  If present, the text string will
#     blink when it is displayed.
#
#  Unless blink is specified, fg_color and bg_color can be any
#  standard color.
#
#  If blink is specified, fg_color and bg_color can only be black,
#  white, red, green, blue, yellow, cyan, or magenta.
#
#  Entry records must be arranged so that the values associated with
#  the text INCREASE from the first record to the last record.
 0.0   “Fuel tank is empty.”               red       white     blink
 0.1   “Fuel is low.”                      yellow    white     blink
 0.25  “Fuel tank is less than half full.” orange    white
 0.50  “Fuel tank is over half full.”      blue      white
 0.95  “Fuel tank is full.”                blue      white

#  Here is how the value lookup works for this example file:
#
#  incoming value  selected text                  reason
#  ─────────────────────────────────────────────────────────────────
#      0.50        Fuel tank is over half full.   0.25 <= 0.50 < 0.95
#      0.09        Fuel tank is empty.            0.00 <= 0.09 < 0.10
#      0.21        Fuel is low.                   0.10 <= 0.21 < 0.25
#     -1.2         Fuel tank is empty.            -inf < -1.20 < 0.0
#     10.2         Fuel tank is full.             0.95 <=10.20 < inf
```

Text table – index lookup file example

```
#
#  indextxt.safs - example definition file for index lookup text table
#

#  header record (MUST BE BEFORE entry records):

TEXT index-lookup

#  text entry records:
#
#  entry format is:
#  txt_string  fg_color  bg_color  <optional> blink
#
#  txt_string is the actual string to be displayed.  MUST be quoted.
#  fg_color is the foreground color.
#  bg_color is the background color.
#  blink is an optional keyword. If present, the text will blink
#     when it is displayed.
#
#  Unless blink is specified, fg_color and bg_color can be any
#  standard color.
#
#  If blink is specified, fg_color and bg_color can only be black,
#  white, red, green, blue, yellow, cyan, or magenta.
#
#  Records are 1-3. Text table indexes corresponding to the
#  entry records are: index 0 = record 1, index 1 = record 2,
#  index 2 = record 3
#
#  Data values are converted to long integers, shifted and masked, and
#  the resulting number is used as the index into the text table.
#  If the resulting index is 0, “valve is closed” is selected, and
#  if it is 2, “valve is fully open is selected. If the index is
#  out of range ( < 0 or > 2 ), “?bad status?” is displayed.
#

“valve is closed.”        white      red      blink
“valve is half open.”     magenta    white
“valve is fully open.”    blue       white    blink
```

APPENDIX L-408 Sample Symbol/Text Tables

APPENDIX M Special & International Characters

You can create the following special and international characters using the Text tool or within any DFD that accepts text entry (except for Text Browser) by using a Compose key sequence.

To create a symbol:

1. Press the Compose key.

2. Press the appropriate key (or keystroke) to produce the first character and hold it down, then complete the action by pressing the key (or keystroke) to produce the second character. The resulting special or international character is created. (The superior 1, 2, and 3 require a third keystroke to complete the character.)

To create the character from a program, use the hex value from the list below.

Hex value	Description	First character	Second character (& third, if needed)	Resulting character
0xA0	Non-breaking space	‘ ‘	‘ ‘	' '
0xA1	Inverted !	‘!’	‘!’	'¡'
0xA2	Cent sign	‘/ ’	‘C’ or ‘c’	'¢'
0xA3	Pounds sterling	‘-’	‘L’ or ‘l’	'£'
0xA4	currency symbol	‘0’ or ‘O’ or ‘o’	‘X’ or ‘x’ or	'¤'

Hex value	Description	First character	Second character (& third, if needed)	Resulting character
0xA5	yen	‘-’	‘Y’ or ‘y’	'¥'
0xA6	broken bar	‘|’	‘|’	'¦'
0xA7	section mark	‘O’ or ‘o’ or	‘S’ or ‘s’ or	'§'
0xA8	diaresis	‘ “ ‘	‘ “ ‘	'¨'
0xA9	copyright	‘C’ or ‘c’	‘O’ or ‘o’	'©'
0xAA	feminine superior numeral	‘-’	‘A’ or ‘a’	'ª'
0xAB	left guillemot	‘>’	‘ >‘	'«'
0xAC	not sign	‘,’ or ‘-’	‘-’ or ‘|’	'¬'
0xAD	soft hyphen	‘-’	‘-’	'-'
0xAE	registered	‘O’ or ‘o’	‘R’ or ‘r’	'®'

Hex value	Description	First character	Second character (& third, if needed)	Resulting character
0xAF	macron	‘-’	‘^’	'¯'
0xB0	degree	‘*’ or ‘0’	‘^’	'°'
0xB1	plus/minus	‘+’	‘-’	'±'
0xB2	superior 2	‘2’	‘2’ ‘^’	'²'
0xB3	superior 3	‘3’	‘3’ ‘^’	'³'
0xB4	acute accent	‘\’	‘\’	'´'
0xB5	mu	‘/’	‘u’	'µ'
0xB6	paragraph mark	‘!’	‘P’ or ‘p’	'¶'
0xB7	centered dot	‘.’	‘^’	'·'
0xB8	cedilla	‘,’	‘,’	'¸'

Hex value	Description	First character	Second character (& third, if needed)	Resulting character
0xB9	superior 1	‘1’	‘1’ ‘^’	’¹’
0xBA	masculine superior numeral	‘O’ or ‘_’	‘^’ or ‘o’	’º’
0xBB	right guillemot	‘?’	‘?’	’ ” ’
0xBC	1/4	‘1’	‘4’	’¼’
0xBD	1/2	‘1’	‘2’	’½’
0xBE	3/4	‘3’	‘4’	’¾’
0xBF	inverted ?	‘<‘	‘<‘	’¿’
0xC0	A with grave accent	‘A’	‘‘’	’À’
0xC1	A with acute accent	‘\’	‘A’	’Á’
0xC2	A with circumflex accent	‘A’	‘^’	’Â’

Hex value	Description	First character	Second character (& third, if needed)	Resulting character
0xC3	A with tilde	‘A’	‘^’	'Ã'
0xC4	A with diaresis	‘ “ ‘	‘A’	'Ä'
0xC5	A with ring	‘*’	‘A’	'Å'
0xC6	AE dipthong	‘A’	‘E’	'Æ'
0xC7	C with cedilla	‘,’	‘C’	'Ç'
0xC8	E with grave accent	‘E’	‘‘’	'È'
0xC9	E with acute accent	‘\’	‘E’	'É'
0xCA	E with circumflex accent	‘E’	‘^’	'Ê'
0xCB	E with diaresis	‘ “ ‘	‘E’	'Ë'
0xCC	I with grave accent	‘I’	‘‘’	'Ì'

Hex value	Description	First character	Second character (& third, if needed)	Resulting character
0xCD	I with acute accent	‘\’	‘I’	'Í'
0xCE	I with circumflex accent	‘I’	‘^’	'Î'
0xCF	I with diaresis	‘ “ ‘	‘I’	'Ï'
0xD0	Uppercase eth	‘-’	‘D’	'Ð'
0xD1	N with tilde	‘N’	‘~’	'Ñ'
0xD2	O with grave accent	‘O’	‘‘’	'Ò'
0xD3	O with acute accent	‘\’	‘O’	'Ó'
0xD4	O with circumflex accent	‘O’	‘-’	'Ô'
0xD5	O with tilde	‘O’	‘~’	'Ô'
0xD6	O with diaresis	‘ “ ‘	‘O’	'Ö'
0xD7	multiplication sign	‘x’	‘x’	'x'

Hex value	Description	First character	Second character (& third, if needed)	Resulting character
0xD8	O with slash	‘/’	‘O’	'ø'
0xD9	U with grave accent	‘U’	‘‘’	'Ù'
0xDA	U with acute accent	‘\’	‘U’	'Ú'
0xDB	U with circumflex accent	‘U’	‘^’	'Û'
0xDC	U with diaresis	‘ “ ‘	‘U’	'Ü'
0xDD	Y with acute accent	‘\’	‘Y’	'Ý'
0xDE	Upper case thorn	‘H’ or ‘p’	‘T’ or ‘|’	'þ'
0xDF	German double-s	‘s’	‘s’	'ß'
0xE0	a with grave accent	‘‘’	‘a’	'à'
0xE1	a with acute accent	‘\’	‘a’	'á'
0xE2	a with circumflex accent	‘^’	‘a’	'â'

Hex value	Description	First character	Second character (& third, if needed)	Resulting character
0xE3	a with tilde	‘a’	‘~’	'ã'
0xE4	a with diaresis	‘ “ ‘	‘a’	'ä'
0xE5	a with ring	‘*’	‘a’	'å'
0xE6	ae dipthong	‘a’	‘e’	'æ'
0xE7	c with cedilla	‘‘’	‘c’	'ç'
0xE8	e with grave accent	‘‘’	‘e’	'è'
0xE9	e with acute accent	‘\’	‘e’	'é'
0xEA	e with circumflex accent	‘^’	‘e’	'ê'
0xEB	e with diareses	‘ “ ‘	‘e’	'ë'
0xEC	i with grave accent	‘‘’	‘i’	'ì'
0xED	i with acute accent	‘\’	‘i’	'í'

Hex value	Description	First character	Second character (& third, if needed)	Resulting character
0xEE	i with circumflex accent	‘^’	‘i’	'î'
0xEF	i with diaresis	‘ “ ‘	‘i’	'ï'
0xF0	Lower case eth	‘-’	‘d’	'đ'
0xF1	n with tilde	‘n’	‘~’	'ñ'
0xF2	o with grave accent	‘‘’	‘o’	'ò'
0xF3	o with acute accent	‘\’	‘o’	'ó'
0xF4	o with circumflex accent	‘^’	‘o’	'ô'
0xF5	o with tilde	‘o’	‘~’	'õ'
0xF6	o with diaresis	‘ “ ‘	‘o’	'ö'
0xF7	division sign	‘-’	‘:’	'÷'
0xF8	o with slash	‘/’	‘o’	'ø'

Hex value	Description	First character	Second character (& third, if needed)	Resulting character
0xF9	u with grave accent	‘‘’	‘u’	'ù'
0xFA	u with acute accent	‘\’	‘u’	'ú'
0xFB	u with circumflex accent	‘^’	‘u’	'û'
0xFC	u with diaresis	‘ “ ‘	‘u’	'ü'
0xFD	y with acute accent	‘\’	‘y’	'ý'
0xFE	Lower case thorn	‘h’ or ‘p’	‘t’ or ‘|’	'þ'
0xFF	y with diaresis	‘ “ ‘	‘y’	'ÿ'

MDB/SAMMI Types

This appendix shows the predefined MDB data types and the corresponding SAMMI data types.

MDB End Item Type	SAMMI Data Type
EGSE_INTEGER_MEASUREMENT	long
EGSE_INTEGER_SW_VARIABLE	long
UNSIGNED_INTEGER_MEASUREMENT	long
UNSIGNED_INTEGER_SW_VARIABLE	long
EGSE_FLOAT_MEASUREMENT	float
EGSE_FLOAT_SW_VARIABLE	float
DOUBLE_FLOAT_MEASUREMENT	double
DOUBLE_FLOAT_SW_VARIABLE	double
EGSE_DISCRETE_MEASUREMENT	text, long (1)
EGSE_DISCRETE_SW_VARIABLE	text
BOOLEAN_MEASUREMENT	text,long (1)
BOOLEAN_SW_VARIABLE	text

(1)

text - If linked to TEXT display type.

long - If linked to DYNAMIC OBJECT, OBJECT ICON and similar display types via their raw values (only possible for MEASUREMENTs, since SW VARIABLEs do not have raw values).

APPENDIX L-420 Sample Symbol/Text Tables

APPENDIX L Internal Errors - Log Files L-421

If you ncounter an Internal Error in the FWDU software you should:

1. Write the error message and all the Debug information the error provides if any.
2. Note how the error occureed. What did you do and can you reproduce the error.
3. Take a copy of the *log files* (see below) and - if the software completely crashed - take a copy of the *core* file.
4. Read the release description to determine if the error is known and to see if there is a work around.

Log Files

After each run of the FWDU one or more log files are generated. The log files are copied to the directory $FWDU_HOME/data. They all end on .log. To make a copy of all the log files write the following in a command -tool:

- cp $FWDU_HOME/data/*.log ~/.

SAMMI has a log file named: **s2_error.*n*.log**. To view this file write **view_log** in your home directory after the copy.

The FWDU writes a log file named **fwdu_fe**.**log**. To view this write **more fwdu_fe.log** in your home directory after the copy.

The fwdu_editor writes a log file named **fwdu_te**.**log**. To view this write **more fwdu_te.log** in your home directory after the copy.

APPENDIX L-422 Sample Symbol/Text Tables

Glossary

The following glossary may have varying utility for Format Editor users. Terms appearing in **boldface** type in a definition are themselves defined in the glossary.

alarm
A notification transmitted to the user when received data exceeds pre-set limits. For example, a boiler may reach a dangerously high temperature, or the price of a stock may reach its desired value. In either case, a message is sent to the user that may flash, change color, or otherwise attract the user's attention so that appropriate action may be taken. Alarms are stored for later review. Compare to **event**, which involves the system rather than incoming data.

client
A **process** that makes a request for some sort of action of another, cooperating program called a **server**. For example, a client process might ask a server to update a certain piece of data, or to add a **window** to the display. *See also* **server**.

COF
Columbus Orbiting Facility. The european part of the International Space Station.

console
The "control" system in a multi-user or multi-system environment. In a *Sammi* environment, **console** refers to the system on which *Sammi* is physically running. A *Sammi* session might be running on the console, but users on other computers connected or networked to the console would have access to the session.

composite
A set of static and dynamic objects grouped to form a single entity which is then saved into a file for use in **formats**.

CPL
Crew Procedure Language.

CRT
Cathode-ray tube, the original type of computer display. In programming, now a generic reference to any monitor or display.

DFD
Dynamic field description. The area in a *Sammi* **format** through which data is displayed. Also referred to as display type.

event
An occurrence involving the computer system, such as a user logging on or off, starting or stopping an application, entering data, etc. An event may cause a message to appear on the display. Compare to **alarm**, which results from the nature of the data itself.

flag An option attached to a command that modifies the command's behavior in some way. Typically preceded by a hyphen (-).

format A discrete element of a user interface displayed on the screen; created using the *Format Editor*. The *Sammi* Command Window is a format, for example. *See also* **composite** and **window**.

FWDU Flight Window Definition Utility. The modified Sammi Format Editor.

host A system on which software is physically running. A remote host is a system running software which the user reaches over a network.

icon A **window** reduced to a small symbol of itself. An action or program going on inside the window when it is iconified typically continues, but the output is not visible until the window is de-iconified. *See* **window**.

I_MDB Interactive MDB Browser. See MDB.

integer A number with no decimal. For example, "2" and "1000" are integers; "2.0" and "100.4436" are not. *See also* **real numbers**.

interface An application through which another application is made accessible to the user or to a third application. A *Sammi* application, for example, provides an interface between the user and the application which he or she is monitoring, or with which he or she is interacting.

ISS International Space Station.

layering A way of creating a complex format. Layering is similar to a slide presentation that has several overlays, each overlay representing a level of complication.

LAPAP Laptop Application. The onboard IBM Thinkpad laptop with specialized software including the MCD which is used for displaying the synoptic displays in the COF.

MCD Mission Control and Display. The onboard logical server.

MDA Mission Database Application.

MDB

Mission Database

option

See flag.

palette

This is a format that has several selections. Two examples are the *Color Palette* and the *Icon Palette*.

process

A program that is running on a computer. In *Sammi*, the `start_sammi` command actually begins a process called `s2_sysinit`; it is this process that actually starts a *Sammi* session; the **quit** command stops or "kills" the processes that run during a *Sammi* session.

real number

In the *Sammi* system, a number with decimal places. For example, "2.0" and "100.4436" are real numbers; "2" and "100" are not. In strict mathematical terms, all **integers** (whole numbers) are real numbers, but only real numbers without decimal points are integers. *See also* **integers**.

server

1. hardware: a system on which a program or set of data resides, typically available to other systems over a network. 2. software: a **process** that is waiting to be contacted by a **client** process so that the server can do something for the client. Some *Sammi* processes are clients that request data from data servers; other *Sammi* processes are clients that request **window** manipulation functionality from an X Server. *See also* **client**.

UNIX

A very powerful multi-user, multi-tasking, platform-independent operating system; *Sammi* typically runs under UNIX or some variant thereof.

userid

An ID assigned to you when your system administrator enters you into the *Sammi* system. Used as part of the logon process.

X Window System

An industry-standard windowing system developed at M.I.T. and running under the **UNIX** operating system. In *Sammi*, the format designer is operating under the X Window System or a variant but need not interact with it.

window

1. In the **X Window System**, a rectangular area of any size that works like a miniature screen; may be moved, sized, **icon**ified, etc. 2. In the *Sammi* Graphical Environment, a "page" of a user interface displayed inside an X Window.

Also called a "format," although a **format** is the element built using the Format Editor that is subsequently displayed through the X Window System.

workstation A desktop computer system equipped with sophisticated graphics capability and a multi-tasking operating system; usually, but not always, networked to other systems. A smaller system can function like a workstation if it has network access to workstation-level graphics and operating system.